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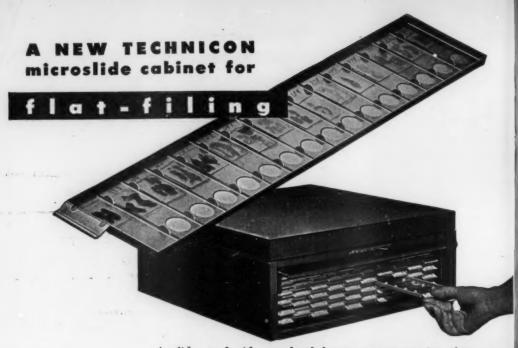
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The Teaching Societies

E VERY scientist teaches some of the time and many teach all the time. Indeed, the fruits of research are in large part the end product of a teaching process. When it is good, science can flourish; when it falters, there is a waste of resources, human and material.

In all the learned societies and sections that comprise our Association there is growing concern with problems of teaching-not in the narrow pedagogical sense, but in the sense of broad educational policy. The painful shortage of men and women with talent for research makes necessary a broadening of the base from which this talent can be drawn, and better means for its early identification and development. If college students show woeful lack of preparation in fundamentals of mathematics and science, the remedy can only be found in the curriculum of the schools. When support for research comes too slowly and too reluctantly from Congress, it must be that our people are scientifically illiterate and that they are so, in part, because science plays too small a role in general education. And-who are the teachers of science? How were they recruited, selected, trained, and certified for their jobs? Scientists cannot afford to leave these matters to others. Annoyance with, and sharp criticism of, the educationists" have not and will not bring improvement. Neglect can only strengthen the iron curtain between the science specialist and the science

During the past ten years, the AAAS has fostered the growing interest in teaching problems through its Cooperative Committee on the Teaching of Science and Mathematics (Science, 111, 197 [1950]). Seventeen national scientific and science teaching societies are cooperating through their 17 representatives in a continuous study of vital issues in science education. Through conferences, symposia, and published investigations, the committee calls attention to problems and

helps to solve them. The recent annual meetings of the AAAS show increasing participation by school and college science teachers.

In about a month, Congress will arrive at monumental decisions with reference to our manpower. Now that all have spoken and all points of view have been expressed, it is clear that no one has challenged the wisdom of the Cleveland AAAS resolution. Ways are sure to be found for making "maximum use in the present emergency of the scientific and technical skill possessed by our trained personnel" and for insuring "an adequate continuing supply of such trained personnel."

Regardless of the specific provisions in the new Selective Service law, there are important and definite implications ahead for teachers of science. For the high schools, it will be more important than ever before to differentiate between college-bound and non-college-bound students. If, through intensification though not curtailment of studies, young people can reach college six months or a year sooner than normal, valuable time will be saved for additional college training. The non-college-bound students will also need special consideration, though not acceleration, in terms of general and vocational education in science. In the colleges, the courses in science and mathematics for freshmen and sophomores will need review and modification. New problems in personnel guidance will arise at both high-school and college levels. The need for science teaching apparatus and, above all, the need for adequate pre- and in-service teacher training programs will become paramount. And an adjunct to the work in all schools and colleges will be the responsibility we must all assume in civil defense.

The Cooperative Committee plans to devote itself to science teaching problems as they crystallize out of the national emergency.

MORRIS MEISTER

Chairman, AAAS Cooperative Committee

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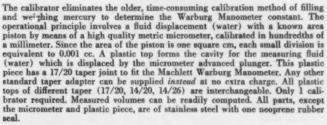
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THE CHEMICAL RESEARCH LABORATORY is one of the stations of the Department of Scientific and Industrial Research and was founded in 1925. It is situated in the same grounds as the National Physical Laboratory at Teddington, which is within easy reach of London by train. The present main building was completed in 1933, and during 1948–47 extensive alterations were carried out to adapt the laboratory to new developments of the program and to make maximum use of the accommodation. A temporary building alongside, which provided for twenty workers, was added in 1947; another small building was completed during 1950.

The buildings have a total floor space of about 36,000 square feet, with about seventy rooms of various sizes. Several of these are devoted to special studies, such as large-scale operations, spectroscopy (from infrared to ultraviolet), radiometry, microanalysis, high-efficiency fractionation, electron diffraction, the "rotor" test for corrosion, microbiology, and the National Collection of Industrial Bacteria. The laboratory has a drawing office and workshops manned by an experienced staff, engaged on the design, construction, and maintenance of apparatus. A glassworking unit is available for the construction of special glass apparatus. In addition, there are administrative offices, a library, and stores.

The laboratory is under the executive control of a director who is responsible to the Secretary of DSIR. R. P. Linstead, C.B.E., F.R.S., was director from September 1945 to May 1949. Previous directors have been Sir Richard Threlfall, G.B.E., F.R.S. (1925–27); Sir Gilbert Morgan, O.B.E., F.R.S. (1927–38); and G. S. Whitby (1939–42). D. D. Pratt, O.B.E., acted as superintendent from 1942 to 1945 and is at present in charge of the laboratory.

The functions of the laboratory are: (a) to carry out objective, fundamental chemical research, including development work, insofar as this may be necessary to demonstrate the industrial value of any discoveries that may be made; and (b) to carry out appropriate chemical researches on request and to provide technical advice to other sections of the department, other government departments, and British industry.

These definitions clearly indicate that the work of the laboratory should be of two kinds: that undertaken as part of its own organized and approved program, and that carried out on request for other agencies. It is appropriate that the work of a national research establishment should have this dual nature, but it is important that a proper balance be preserved between the two aspects. Moreover, in view of the large amount of chemical research being carried out in other laboratories, eareful selection of topies in the program of fundamental research is essential.

The general policy underlying the selection of topics is that the laboratory should study basic problems of chemistry and chemical technology that require the attack of a skilled team over a long period. Its work should not duplicate that going forward in universities and industry, although some duplication may on occasion be unavoidable.

Consideration of these factors led to the formulation of five main themes, which are particularly appropriate for inclusion in the program of the laboratory:

Researches leading to fundamental data of general value

II. New methods and techniques

III. The conservation of essential materials

IV. The utilization of indigenous raw materials, particularly those of low grade, including wastes

V. New materials and processes

Later, references will be made to these themes to show how they are being implemented in the present research work of the laboratory.

The program is reviewed by the Chemistry Research Board, appointed (1) to advise generally on research to be undertaken by the department's Chemical Research Organization; (2) to submit annual programs of research and to advise on the conduct of approved investigations; and (3) to submit annual reports. The present chairman of the board is E. L. Hirst, F.R.S. The members are men of wide knowledge and experience from universities and industrial organizations. Interested government departments are represented on the board by assessors. The approved program of the laboratory is circulated at intervals to industrial firms as a safeguard against duplication of work already proceeding within these organizations.

The total staff at present is 158, of whom 38 are scientific officers, and 59 experimental officers. Research work is organized in six main divisions.

CORROSION OF METALS GROUP

The prevention of loss of metals by corrosion is a subject under Theme III eminently suitable for systematic long-term study under government auspices, and its many aspects have been studied at the laboratory since its foundation. The group consists of two sections dealing with immersed corrosion and atmospheric corrosion, respectively. (Underground micro-

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biological corrosion is investigated by the Microbiology Section and will be discussed later.)

Researches on immersed corrosion include a study of the influence of surface finish on the corrosion rate of mild steel in aqueous solutions under conditions of rapid movement. The behavior of low-alloy steels in static and moving conditions is also being investigated. The high-speed rotor, developed by the laboratory, is used for assessing the value of pretreatment of steel pipes prior to painting, and for the evaluation of anticorrosive paints for underwater use in industrial and marine conditions. A new electrochemical technique has shown great promise in detecting the initial breakdown of paint coatings under immersed conditions. An improved technique for the removal and subsequent manipulation of surface oxide films has proved of great value in facilitating the chemical analysis and electron diffraction examination of these films. Researches during the war brought to light the valuable corrosion-inhibitive properties of sodium benzoate. Tests showed, however, that a concentration of sodium benzoate in distilled or tap water or in glycol solution failed to prevent corrosion of cast iron. Sodium nitrite, on the other hand, was found to be an effective inhibitor for cast iron, but has the serious disadvantage of attacking soldered joints. Further investigations have now shown that sodium benzoate with a smaller percentage of sodium nitrite in 20 per cent glycol solution adequately protects both cast iron components and soldered joints under the conditions that normally obtain in engine cooling systems. These findings are covered by Patent Application No. 10,471/49. Further studies are going forward on the mechanism of corrosion inhibition, together with a search for other inhibitors, including "vapor-phase" inhibitors.

The Atmospheric Corrosion Section deals with the application of sodium benzoate and the mixed inhibitor in nonimmersed conditions—e.g., prevention of corrosion of metal goods in transit or storage by inhibitive packages or coatings. Another subject is the development of an accelerated test for protective coatings on steel. In one test, which has also been applied to the examination of low-alloy steels, the specimens are subjected to a continuous cycle of spraying and drying, and in another test the specimens are suspended in a cylindrical glass vessel fitted with heating and cooling coils, so that there is a continuous deposition of moisture containing sulfur dioxide on the test surfaces.

INORGANIC GROUP

Pure metals. A survey of coal and coal products of Britain as sources of gallium and germanium has been made, and numerous samples of coals from overseas have also been examined for the presence of minor metals. A process for the preparation of gallium from flue dusts (Theme IV) has been worked out, and a quantity of the pure metal isolated. Samples have been made available to various research

laboratories for examination of its properties. Investigations on the purification of germanium are also in progress.

In 1948 the Chemistry Research Board set up a Pure Metals Committee to stimulate interest in, and to coordinate the preparation of, pure metals for research and development purposes. Considerable progress has been made in the formation of a stock collection of pure samples of those metals not readily available commercially.

A recent addition to the program is the conversion of phosphate rock into forms of fertilizer that are easily assimilated by plants. For this conversion new methods which require less sulfuric acid than is used at present in the fertilizer industry are being examined, so as to reduce the consumption of imported sulfur (Theme III). Preliminary experiments have been confined to wet methods of treating rock and, in particular, to the use of mixtures of nitric and sulfuric acids. Promising results have been obtained, and field trials are in progress.

The group is equipped with three spectrographs, and a microanalytical laboratory carries out the analyses needed by the laboratory.

RADIOCHEMICAL GROUP

This group, which is engaged on a program of work for the Division of Atomic Energy, Ministry of Supply, comprises analytical and concentration studies on radioactive minerals and ores. Chemical, physical, and radiometric methods are employed in this work. An outstanding development is the application of methods (Theme II) based on solvent extraction in conjunction with the use of cellulose and other solid adsorbents, for preparing and analyzing inorganic substances, both qualitatively and quantitatively.

ORGANIC GROUP

The group consists of three sections: Purification and Measurement, Organic Intermediates I, and Organic Intermediates II.

Precise data on the fundamental constants of pure chemicals are invaluable to the chemist in the study of possible chemical reactions and to the chemical engineer in designing plants. The work, which falls under Theme I, is of two kinds: (a) the preparation of pure compounds and (b) determination of the constants with great precision. The materials selected for initial study were the aromatic and heterocyclic substances present in coal tar fractions. Purification is affected by fractional distillation, using columns of 50 plates or better, and by fractional crystallization, together with chemical methods. Apparatus for direct recording of freezing point curves are available, capable of assessing purities of the order of 99.97 mol per cent. The constants to be determined include boiling and melting points, specific and latent heats, density, refractivity, and absorption spectra. Thermochemical data will be determined in collaboration with

the Physics Division, National Physical Laboratory.

The Organic Intermediates Section I is concerned with the chemistry of cyclic compounds, principally aromatic and heterocyclic. Coal tar constitutes a rich source of these compounds, and the investigations may be included as an example of the utilization of indigenous raw materials (Theme IV). Investigations have been made on acenaphthene, diphenylene oxide, and pyridine bases. Acenaphthene has been dehydrogenated in the vapor phase to give high yields of acenaphthylene, which polymerizes with other monomers to give interesting plastic materials. By hydrogenolysis of pyridine, products having some insecticidal activity have been isolated.

The main investigation of the Organic Intermediates II Section is the study of the specialized techniques (Theme II) required for the synthesis of isotopically labeled compounds. The work is confined to research on preparative methods and does not include largerscale production. Earlier the section carried out investigations on the preparation of organosilicon com-

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High Polymers and Plastics Section. The work of this section is devoted mainly to the study of ion exchange and allied properties of high polymers, including an investigation of the effect of polymer structure on the equilibria and kinetics of ion exchange, the development of improved exchangers, and an examination of the application of ion-exchange resins in chromatographic separations and other fields. A new research has begun on the relationship between the properties and chain length of carefully fractionated linear polymers, with the immediate object of finding improved methods of determining molecular weight distribution (Theme V).

Microbiology Section. Originally the effort of this section was devoted to the study of sulfate-reducing bacteria and their various activities as they affect industry. A study of their fundamental properties is in progress, including investigations of their isolation in pure culture, growth (heterotrophic and autotrophic), inhibition, morphology, and enzymic constitution. The most important economic activity of these organisms is their participation in the external corrosion of ferrous pipes in water-logged neutral clay soils, and many inquiries for advice on this problem are dealt with by the laboratory. Sulfate-reducing bacteria also sometimes play a part in the internal corrosion of water mains. Other deleterious activities being studied include the pollution of water in gas holders, coal mines, open pools, and oil wells. Recently the scope of the work has been widened to include sulfide-oxidizing bacteria and the production of sulfur by bacterial action; natural deposits of sulfur produced in this way have been examined.

The section is also responsible for the maintenance of the National Collection of bacteria of industrial importance. This duty was taken over in January 1950, and already a large number of cultures have been sent out to meet requests from many countries.

So far attention has been mainly focused on the program work but, as previously stated, the laboratory also performs the duty of carrying out work on request by other organizations. The main items within this category are: the large program on behalf of the Division of Atomic Energy, Ministry of Supply, a study of the corrosion of boiler tubes on behalf of the British Shipbuilding Research Association, the preparation and supply of pure hydrocarbons as spectrographic standards, the study of preparative methods for compounds containing tracer elements, and the National Collection of Industrial Bacteria.

In conclusion, some of the past achievements of the laboratory may be stated briefly. These include:

- a) The discovery of the anodic oxidation of aluminum and alloys as a method of protection;
- b) The development of the C. R. L. rotor test for accelerated corrosion in immersed conditions;

e) The discovery of ion-exchange resins;

d) Research on the composition of tars obtained by the low-temperature carbonization of coal, and utilization of various products, notably tar acids;

e) Research on high-pressure reactions leading to the

formation of aliphatic alcohols and acids;

- f) The development up to a pilot plant stage of a method for the production of food yeast from molasses;
- g) The production from indigenous material of a cheap and effective foaming agent for combating petrol fires; h) Researches on chemotherapeutically active materials
- of the phenanthridine series which led to the discovery of C.R.L. 1553 (dimidium bromide), which has been widely used against trypanosome diseases of cattle in Africa.

Subjects of agricultural interest have been the production of sheep dips containing DDT, and sprays for killing potato haulms; a short-term investigation for the Board of Trade to provide a means of preventing the caking of fertilizers.

The results of the laboratory's researches are communicated to British industry and published in the usual scientific journals. In some cases special reports are issued through H.M. Stationery Office. Reviews of the work of the laboratory for the period ending December 31, 1934, for the triennial period ending December 31, 1937, and for the years 1938-46 have been published. Since 1946, annual reports, entitled Chemistry Research, have been issued through H.M. Stationery Office for the years 1947, 1948, and 1949.

Active steps are taken to maintain and improve external relations with industry, particularly by exchange of visits and by communications through research and industrial associations.

During the period of the Festival of Britain (May-September, 1951), the Department of Scientific and Industrial Research is arranging for small parties of scientists and technologists from overseas to visit the Chemical Research Laboratory. Accommodation for such parties is limited, and applications to join them should be made as early as possible to the Secretary, Department of Scientific and Industrial Research, Charles House, 5-11, Reyent St., London, S.W.I. (The envelope should be marked "Festival Visits".) Applicants should state the time during which they expect to be in this country.

Race and Humanity

Th. Dobzhansky

Department of Zoology, Columbia University, New York

ROBABLY NO OTHER SCIENTIFIC CON-CEPT has been so notorious for vagueness and ambiguity as that of race. Certainly none has been more unceremoniously exploited as a cloak for prejudice and malevolence. And this despite the fact that anthropologists and biologists have studied races in man and in other organisms for more than a century and a half. A very heartening break in this situation has, however, become apparent within the past decade or two. The rapid advances in population genetics have shed new light on race as a biological phenomenon and as a stage of the evolutionary development of sexually reproducing species. It was, then, only a question of time when the study of races of man would be revised and revived under the impact of modern population genetics. This reformation of the raciological thinking in anthropology is now at hand. The first and the second of the three books1 under review are the harbingers of a new era. The third is a useful anthology of raciological writings covering the late eighteenth century up to the modern era.

Professor Count's anthology provides a historical perspective and a contrasting background against which the modern reform will stand out in bold relief. From its very inception, the race concept has suffered from an inner contradiction (not to speak of its perennial misuse for political propaganda purposes). Race has been a practical and convenient category of classification, with the aid of which the diversity of human types could be efficiently described and neatly pigeonholed. For this purpose it is useful to set up so-called racial "types." The types are arrived at by estimation, or by calculation, of averages of various traits observed in the samples of individuals examined. No objection could be raised against this procedure if it were used solely as a technique of cataloguing. But a type once created has an insidious way of dominating its maker. It becomes "the race," a sort of noumenon of which the existing individuals are only imperfect representatives. Needless to say, such a race concept is basically antievolutionist, as well as incompatible with Mendelian genetics. And yet the idea of change and development has been a part of anthropological thinking since the times of Buffon, Kant, and Blumenbach. Darwin entitled his great work *The Origin of Species*; origin of races would have been no striking novelty either to anthropologists or to biologists.

An uneasy compromise was arranged between the contradictory concepts of race as an abstract but stable type and race the ineluctably changing biological reality. This compromise involved the assumption that there existed at some obscure time in the past socalled primary races, which were supposedly "pure" and conformed to their ideal types. The primary races engaged, however, in long-continued miscegenation; the miscegenation has not only resulted in numerous "mixed" or "secondary" races, but also engulfed and largely obliterated the pure primary ones. The latter can be discerned at present, in the words of an outstanding living anthropologist (Howells), only "by a process of personal estimation which is reminiscent of divination." Another trouble with the pure primary races is that a pure race makes no sense at all from the standpoint of genetics, except in asexually reproducing organisms. In sexual and cross-fertilizing species such as man, no two individuals are likely to have the same genotype; parents and offspring, as well as brothers and sisters, are genetically different. Nevertheless, the compromise has continued down to our day, long after it has lost every semblance of justification. Professor Count might have saved a not-inconsiderable number of pages of his anthology by deletion of some of the more recent lucubrations concerning this topic.

Professor Boyd's book contains a detailed, in places caustic, and altogether devastating critique of the abuses of old-fashioned raciology. But Boyd is certainly not one of those who need to conceal their intellectual sterility by being severely cricical of the work of others. His book is primarily constructive. The central idea is that every human being is a member of a biological community within which marriages are concluded. Such a community, termed Mendelian population or isolate, possesses a gene pool, from which the genes of the individuals are drawn, and to which some of them are returned unless the individual dies childless. Mankind, the human species, is the most inclusive Mendelian population. It is, however, a very complex system of isolates, kept apart by geography or by social forces. It happens that these subordinate populations often differ in relative frequencies of genes for various traits in their gene pools. Such different populations are races. Boyd defines (p. 207) "a human race as a population which differs signifi-

¹ Genetics and the Races of Man. An Introduction to Modern Physical Anthropology. W. C. Boyd. Boston, Mass.: Little, Brown, 1950. 455 pp. \$6.00; Races: A Study of the Problems of Race Formation in Mass. C. S. Coon, S. M. Garn, and J. B. Birdsell. Springfield, Ill.: Thomas, 1950. 153 pp. \$3.00; This Is Race. An Anthology Selected from the International Literature on the Races of Mass. E. W. Count, Ed. New York: Schuman, 1950. 747 pp. \$7.50.

cantly from other human populations in regard to the frequency of one or more of the genes it possesses. It is an arbitrary matter which, and how many, gene loci we choose to consider as a significant 'constellation'."

The way to describe races is, then, to study the frequencies in human populations of variable genes. In the present state of human genetics, only a few traits are analyzed into clear-cut genic elements. Such traits become particularly important in race studies. The best known among them are inherited variations in some components of the blood-the blood groups. Boyd is one of the outstanding authorities on blood grouping, and his synthesis of the available data is a masterly one. He summarizes his conclusions by proposing a division of mankind into the six following races: (1) Hypothetic Early European, (2) European or Caucasoid, (3) African or Negroid, (4) Asiatic or Mongoloid, (5) American Indian, and (6) Australoid. Boyd shows further that the information available on the genetics of other human traits, scanty though it is, supports his classification, which is, of course, quite similar to what some classical anthropologists inferred from their measurements and observations.

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It may come as a shock, then, that Coon, Garn, and Birdsell assume thirty human races, not one of which coincides with any of the six proposed by Boyd! Although these authors have concentrated their attention on quite different traits, and have ignored the blood group genes particularly, they are aware of the fundamentals of modern genetics (despite some minor slips in their book). A dissonance of this kind would have been exasperating to old-fashioned taxonomists, but the genetic race concept has removed the sting from such discrepancies. The human species is compounded of numerous subordinate Mendelian populations, which form an intricate hierarchy, beginning with clans, tribes, and various economic and cultural isolates, and culminating in "major" races, and finally the species. Now, not only the major but also the minor populations often differ in gene frequencies. They are races" by definition. Just how many races we recognize by giving them names is purely a matter of convenience. It is quite natural that some students may find their purposes served best by distinguishing only the major population groups, whereas others may prefer finer subdivisions. In fact, Coon, Garn, and Birdsell distinguish among their thirty races six "putative stocks": Negroid, Mongoloid, White, Australoid, American Indian, and Polynesian. The similarity between their stocks and Boyd's races is evident.

Human populations exist by virtue of the reproductive bonds that give them biological reality. Genetic differences between such populations exist regardless of whether anthropologists choose to attach racial labels to them. What is not arbitrary is the recognition that a certain group of individuals constitutes a Mendelian population, and that this population differs from others in the frequencies of certain genes. One must, however, be on guard not to invent a "population" by hand-picking a "group" of individuals who

do not belong to a common gene pool. For example, people with O blood group, or long-headed people, or criminals are not Mendelian populations and cannot reasonably be called races. Such mistakes were not infrequently made in the past.

Description and genetic characterization of races are, however, only the first steps toward their understanding. Racial differentiation is a product of the evolutionary development of the human species. What forces have brought it about, and what changes are likely to be wrought by these forces in the future? Amazingly little attention has been given to the problem of mechanism of origin of human races in classical anthropology. The genetic theory of evolution recognizes four principal agencies of change: mutation, gene recombination (hybridization), genetic drift, and natural selection. Boyd's book gives perhaps the first systematic consideration of the possible roles of these agencies in the differentiation of human races. His analysis is admirable, but in the end the conclusion is inescapable that far too little is known at present about the causal aspects of human evolution to permit a clear picture to be drawn. This is a task for the future.

The fact does stand out, however, that selection is in all probability the key to understanding of human evolution. And yet it has been customary in anthropology to assume that most of the distinctions between human races are adaptively neutral. This assumption has even been made a part of some definitions of race. The reason for this situation is simply that no attention has been given, and no experimental work undertaken, to test the influence of genetically variable human traits on the adaptive value (Darwinian fitness) of their possessors. It is the considered opinion of this reviewer that this is the most urgent problem of physical anthropology and of human genetics.

For those who would attack this problem, the short book of Coon, Garn, and Birdsell will be invaluable. It contains a collection of hypotheses, inferences, and plain conjectures about the possible adaptive values of human traits. Such hypotheses and conjectures are necessary to stimulate and to guide the experimenter, and they are especially valuable when they are inspired by the firsthand experience with many and diverse human populations which the authors possess. A few examples of the hypotheses will suffice here. The body build of most arctic peoples, characterized by long trunks, short extremities, and low body surface in relation to the volume, is viewed as adaptive in cold climates. Conversely, the linear, skinny body build, with long extremities, found in inhabitants of hot deserts, is interpreted as adaptive under conditions of dry heat. Darkly pigmented eyes are supposed to give higher resolving power under intense illumination than do blue eyes. The characteristic Mongoloid facial structure may be an example of "climatic engineering" which gives the greatest protection in cold and windy climates

The books of Boyd, and of Coon, Garn, and Bird-

sell, show that the stage is now set for important developments in our understanding of human evolution, and particularly of the mechanisms of race formation. New and powerful methods of investigation can readily be evolved through cooperation of anthropologists and population geneticists. Whether our generation will or will not see the realization of these possibilities will depend on how quickly a majority of anthropologists and geneticists perceive the opportunities that are within their grasp.



Technical Papers

Minerals from Pumiceous Tuff in Japan

Toshio Sudo

Geological Institute, Faculty of Science, Tokyo University, Tokyo, Japan

In Japan tuffaceous rocks predominate, especially in the young Tertiary beds. These tuffaceous rocks commonly alter to clays, especially in the case of pumiceous tuff. The writer carried on detailed mineralogical studies on the alteration products, among which several clay minerals have been identified. These data may offer some contribution to the problems of crystallization of natural glass in various geological environments and also to the knowledge of the clay mineral resources in Japan.

In the study of the alteration products of the pumiceous tuff mineralogy, optical, chemical, and thermal properties, x-ray powder patterns, and, in some cases, electron micrographs were taken into account. Although the original rocks appear essentially homogeneous, several alteration products are found, including minerals of the montmorillonite and glauconite-celadonite groups, kaolin, and allophane.

Montmorillonite alteration. The minerals of the montmorillonite group comprise the main mineral component of the bentonites and acid clays in the northeastern part of Japan, where pumiceous tuff is distributed over a wide area. These clays are important as raw materials in certain nonmetallic industries. The color of the montmorillonite is commonly white or gray. The x-ray powder lines of cristobalite often mingle with those of montmorillonite, Rarely, zeolite crystals are associated with the clay. The clay from Yokote-machi, Akita Prefecture, is notable for its strong absorptive properties.

The green-colored montmorillonite has been found in two localities: one is in the clay zones surrounding one of the ore bodies of the Hanaoka Mine, Akita Prefecture, and the other is an alteration product from the inclusions in "Oya-ishi," a tuffaceous rock which is an important building stone in Japan. The green-colored clay from the Hanaoka Mine occurs in the clay zones enclosing the ore bodies. Sericite immediately surrounds the ore masses, and montmorillonite encloses the sericite. The green clay, which partly tarnishes to brown color in daylight, has been identified as montmorillonite containing about 6% ferric iron. The inclusions in "Oya-ishi" are volcanic rock

fragments in the tuff. Some of them exhibit flow structure. The inclusions may turn brown, black, yellow, or white upon exposure, but unweathered specimens are normally green. The green-colored part quickly tarnishes in daylight, to gray to black (within 1 hr) and finally to brown (in a few weeks). The clay forming the inclusion swells and becomes pasty when wet. Under the microscope, the altered part of the inclusion appears as an aggregate of very fine clay flakes; the aggregate shows the vesicular texture of the pumiceous volcanic rock; the centers of some vesicules are filled by limonitic matter. Unweathered green-colored inclusions contain about 13.4% ferric iron, part of which may be limonite; but it is clearly shown from the mineralogical studies that the green mineral is a peculiar variety of montmorillonite high in iron.

Kaolin and allophane alterations. Some pumice beds alter to allophane-for example, the "Kanuma Soil," which forms the surface material in much of Tochigi Prefecture. Limonite commonly imparts a brown color to the clay, which is composed mainly of silica, alumina, and water, but the ratio of silica to alumina is not constant. Some pumiceous rocks alter to hydrated halloysite. The clay near Schichinoe-machi, Aomori Prefecture, is one example. Such clays are abundant in northeastern Japan, and they are characteristically associated with carbonaceous material. The Schichinoe clay is white and isotropic. Its mineralogical properties approximate those of hydrated halloysite, but never agree perfectly with those of typical halloysite. Unlike typical hydrated halloysite, this clay is very easily dissolved in sulfuric acid; the absorptive water content is somewhat larger than that of typical hydrated halloysite; the powder lines are extremely diffuse; the electron micrograph shows mainly irregular and round grains; the differential thermal analysis curve suggests that a small amount of montmorillonite is contained in the interstratified lattice with hydrated halloysite. Apparently the clay is composed of hydrated halloysite mixed with small amounts of allophane and montmorillonite.

Alteration to glauconite-celadonite. Some tuffaceous rocks are very bright green in color. The green tuff is mainly composed of alteration products from pumice. The mineralogical properties of the green mineral approximate those of the mineral glauconite-celadonite, but the alkali content is less; the water content is higher, and the refractive indices are lower. The mineral may be a variety of glauconite and celadonite,

our bearing somewhat the same relation to the latter as these the hydrous micas bear to muscovite. Thus, in spite of jority the essential homogeneity of the original acidic volcanie rocks or pumiceous tuffs, the alteration products ppordiffer because of differences in environment that affect the alteration process. Where the rocks do not undergo leaching, montmorillonite may be produced. In this case, iron and magnesium are retained in the crystal lattice of the clay mineral; when iron is unusually abundant, the peculiar green montmorillonite may be produced. Leaching conditions, on the other hand, yield kaolin or allophane. The leached condition may

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be caused by surface water or the environment accompanying some coally matter. In these cases, the iron is not retained in the crystal lattice but is converted into limonite. The conditions that favor alteration to glauconite-celadonite are obscure, but it is inferred that the alteration may take place under sea water.

One point deserves special notice; that is, in spite of the acidic character of the original pumiceous rocks, an appreciable amount of iron is included in some of the alteration products. It is probable that the iron was not present in the original rock but was introduced or concentrated in the alteration process. It should also be noted that, in many cases, the alteration products do not consist of one type of clay mineral but mixtures of the several minerals. In such cases identification of the individual minerals is very difficult and can best be accomplished by differential thermal analysis. The complex mineralogical properties of Schichinoc clay offer an example and, in the experimental studies, the differential thermal analysis was very helpful.

The Effect of Magnesium Sulfate on Acid Inactivation of Renal and Intestinal Alkaline Phosphatase

Victor M. Emmel

Department of Anatomy, University of Rochester School of Medicine and Dentistry, Rochester, New York

In studying the effects of various enzymatic digestions on histochemically demonstrable alkaline phosphatase, it became necessary to study independently the effect of HCl and MgSO₄ on alkaline phosphatase in histological sections and fresh tissue homogenates of kidney and intestine. It has been reported elsewhere (1) that renal phosphatase is distinctly more sensitive to inactivation by HCl than is intestinal phosphatase. The present data demonstrate that in the presence of MgSO₄, a well-known activator of alkaline phosphatase, the sensitivity of both renal and intestinal phosphatase to acid inactivation is increased.

Paraffin sections of mouse kidney and intestine fixed in cold acetone were prepared by the usual methods (2). Sites of alkaline phosphatase activity were demonstrated by the Gomori technique (3). In the manner previously described (1), sections were exposed to various concentrations of HCl with and without the addition of M/100 MgSO₄ at 37° C for ½ hr prior to staining for phosphatase. The observations recorded in Table 1 indicate that when exposed to HCl alone

TABLE 1

EFFECT OF MGSO₄ ON ACID INACTIVATION OF HISTOCHEMICALLY DEMONSTRABLE ALKALINE PHOSPHATASE IN MOUSE KIDNEY AND INTESTINE

| Treatment I | | lonly | $HCl + M/100 MgSO_4$ | |
|------------------|--------|-----------|----------------------|-----------|
| pH | Kidney | Intestine | Kidney | Intestine |
| H ₂ O | ++++ | ++++ | ++++ | ++++ |
| 5.0 | 4444 | 1111 | 4444 | 4444 |
| 4.5 | ++++ | ++++ | +++ | 1111 |
| 4.0 | ++++ | ++++ | ++ | 4+++ |
| 3.5 | ++++ | ++++ | 0 | +++ |
| 3.0 | ++++ | ++++ | 0 | + |
| 2.5 | 0 | +++ | 0 | 0 |
| 2.0 | 0 | + | 0 | 0 |
| 1.8 | 0 | 0 | 0 | 0 |

Figures on left indicate pH at which sections were treated with HCl or with HCl plus MgSO, at 37° C for ½ hr prior to staining for phosphatase. Amount of activity surviving treatment is recorded as the degree of blackening of the sections.

renal phosphatase is inactivated between pH 3.0 and 2.5, and intestinal phosphatase inactivated at about pH 2.0. When M/100 MgSO₄ is added to the HCl, the ranges over which inactivation of renal and intestinal phosphatases occurs are shifted to about pH 4 and pH 3, respectively.

In comparable quantitative experiments fresh tissue homogenates (4) were treated with HCl or with HCl plus MgSO₄, followed by determination of residual phosphatase activity (5). Fig. 1 illustrates the results obtained with mouse intestine. Comparison of curves I and II shows the activating effect of M/100 MgSO₄ on alkaline phosphatase. The gradual merging of these two curves suggests that the enzyme that has survived treatment with HCl may be less subject to activation

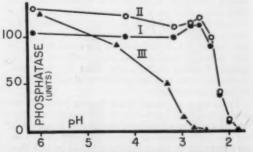


Fig. 1. Effect of MgSO_g on inactivation of intestinal alkaline phosphatase by HCl. Abscissa indicates pH at which fresh tissue homogenates were treated at \$7° C for ½ hr prior to phosphatase determinations. Phosphatase units are arbitrary. Curve I, homogenate treated with HCl only, no MgSO₄ in substrate; curve II, homogenate treated with HCl only, M/100 MgSO₄ in substrate; curve III, homogenate treated with HCl plus M/100 MgSO₆ M/100 MgSO₄ in substrate.

by magnesium. In control experiments it was found that serial dilution of the homogenate, thereby reducing its phosphatase activity, did not in itself significantly alter the activating effect of magnesium. Comparison of curves II and III demonstrates the distinctly increased sensitivity of intestinal phosphatase to acid inactivation in the presence of magnesium. With kidney homogenates magnesium similarly caused increased sensitivity to inactivation by HCl.

Further observations will be necessary to provide a basis for explaining the manner whereby magnesium increases the sensitivity of alkaline phosphatase to inactivation by HCl. It is pertinent to note, however, that Bodansky (4) has found that the activating effects of magnesium and cobalt on purified preparations of rat bone and intestinal phosphatase were markedly altered in the presence of certain amino acids. It is possible that in the present experiments the magnesium-phosphatase complex was more labile and hence more subject to acid denaturation than the noncomplexed form of the enzyme.

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Growth Effects on Chick Fibroblast Cultures of Fractions of Adult and Embryonic Tissue Extracts Following Differential Centrifugation1

R. S. Hoffman, J. A. Dingwall, and W. DeW. Andrus

Department of Surgery, New York Hospital and Cornell University Medical College, New York City

In a previous paper from this laboratory (1) some of the physicochemical properties of the growth-promoting substances contained in a Tyrode's extract of adult sheep heart have been described. In the present communication, attempts to determine roughly the distribution of the active factors between the macroand micromolecular fractions of the crude extract, as well as that obtained from chick embryos, are reported. Tennant, Liebow, and Stern (2) have previously described high-speed differential centrifugation of embryonic extract.

Preparation of extract of adult sheep heart: Sterile adult sheep hearts denuded of pericardium and epicardial fat were cut up and minced in a blender with 6 times their volume of Tyrode's solution. This mixture was kept in the refrigerator for 24 hr and then centrifuged at 2,500 rpm for 20 min. The decanted supernatant extract could be stored in the refrigerator for several months without losing its activity.

The method of preparation of chick embryonic ex-

¹This work was supported by a grant furnished by the American Cancer Society.

TABLE 1

SUMMARY SHOWING COMPARISON OF GROWTH EFFECT OF ULTRACENTRIFUGED FRACTIONS OF ADULT AND EMBRYONIC EXTRACTS WITH WHOLE EXTRACTS AND TYRODE'S SOLUTION CONTROLS

| No. cultures | Fluid phase added | Average size of cultures at 7 days (mm ^s) |
|-----------------|---|---|
| 10 | Adult sheep heart extract, supernatant | 68.5 |
| 10 | Adult sheep heart extract, total | 56.5 |
| 15 | Adult sheep heart extract, residue | 22.0 |
| 5 | Tyrode's solution | 12.0 |
| 10 | Embryonic chick heart extract, supernatant | 33.5 |
| 10 | Embryonic chick heart extract, total | 31.0 |
| 15 | Embryonic chick heart extract, residue | 17.0 |
| 5 | Tyrode's solution | 12.0 |

tract was as follows, being similar to that described by Claude (3). Eight-day-old chick embryos were collected under sterile conditions and after washing with Tyrode's solution and freeing of all extraneous material were finely ground with sterile sand and extracted with 6 volumes of Tyrode's solution. The resulting mixture was allowed to stand overnight and then centrifuged for 20 min at 2,500 rpm. The decanted supernatant fluid was used for the experiments.

The extracts of adult and embryonic tissues were each centrifuged in sterile lusteroid tubes in the concentration rotor of an air-driven high-speed centrifuge for periods of 1-3 hr at 30,000 rpm. The resulting closely packed pellets, representing the macromolecular fractions in each case, were resuspended in Tyrode's solution in amounts corresponding to the original volume of extract, and the growth-promoting activity of both the redissolved macromolecular and the supernatant fractions was tested on chick fibroblast cultures growing in vitro, by the following tech-

Third passage hanging-drop fibroblast cultures from 7-day-old embryonic chick hearts were divided into halves. Each sister half was placed in a Carrel flask (3.5) containing 0.5 ml chicken plasma, 1 ml Tyrode's solution, and 1 drop of chick embryonic extract in order to facilitate formation of a coagulum. The cultures were allowed to grow in this medium for 48 hr, and the increase of surface area during this period was estimated according to the method of Ebeling (5). The 2 fractions of the heart extract were then added to the flasks so that their effects were compared on sister halves of the same cultures, or the activity of each fraction was evaluated by comparison with sister halves of cultures containing only Tyrode's solution in the supernatant phase. Table 1 depicts the results of a series of such experiments.

A survey of the table indicates that the supernatant

fraction of both embryonic and adult tissue extracts is at least as active as the total before ultracentrifugation. After 6 days the average size of the fibroblast cultures to which the supernatant obtained by ultracentrifugation of adult sheep heart extract had been added was 68.5 mm², whereas that of the sister halves treated with total sheep heart extract was 56.5 mm². The average size of the cultures which received the macromolecular residue redissolved in Tyrode's solution was considerably less, measuring only 22 mm², though it was higher than the average (11 mm2) of the controls to which Tyrode's solution alone was added.

The results obtained with embryonic chick extract were similar, although its stimulating action was of a lower order. The average area of cultures treated with chick embryonic extract was 31 mm2, whereas that of the sister halves treated with ultracentrifuged embryonic chick heart supernatant fraction was 33.5 mm². Cultures treated with ultracentrifuged embryonic chick extract residue averaged 17 mm² in area.

Like ourselves, Tennant, Liebow, and Stern (2) also found some growth-promoting activity present in the macromolecular fraction of embryonic extract or residue, but these authors make no mention of the activity of the supernatant fraction. Although the slight degree of stimulation obtained with the macromolecular fraction might be due to the presence of additional nutrient material (4), our experiments show that the principal growth-promoting properties are retained in the supernatant fraction of the ultracentrifuged ex-

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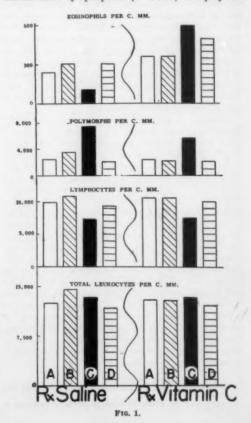
The Influence of Ascorbic Acid Pretreatment on the Leukocyte Response of Rats Exposed to Sudden Stress

Habeeb Bacchus and Charles A. Toompas Physiology Department, The George Washington University School of Medicine, Washington, D. C.

It has been observed that ascorbic acid prevents the adrenal hypertrophy typical of animals exposed to cold environments, and enhances the survival of animals exposed to this stress (1). It was concluded that the vitamin plays a compensatory role not unlike that of some adrenal cortical hormones. Those findings support the concept of an intimate involvement of ascorbic acid in the functional activity of the adrenal cortex (2) and in the utilization of adrenal cortical hormones (3-6)

We decided to investigate the nature of this action of ascorbic acid, using the leukocyte picture and adrenal histochemistry as criteria of adrenal cortex activity. Sixteen Wistar female rats (mean body wt, 175 g) were divided into 2 groups: Group I animals were "pretreated" with 150 mg sodium ascorbate (Vitamin C Injectable, "Roche") per rat in 2 intraperitoneal injections; Group II rats received "pretreatment" with saline solution. Total and differential leukocyte counts by Randolph's method (7) were made of tail blood of 6 animals in each group. All animals received single subcutaneous injections of epinephrine (0.03 mg/100 g body wt) about 6 hr after pretreatment. Blood counts were taken in the following instances: (a) just prior to pretreatment, (b) 3 hr after the completion of pretreatment, (c) 3 hr after the injection of epinephrine, and (d) 24 hr after the epinephrine injection. The remaining 2 animals of each group were killed 1 hr after epinephrine treatment. The adrenals of these animals were treated for the detection of steroids and of ascorbic acid after the methods described previously (8).

The pertinent data on the leukocytes are presented in Fig. 1. It is observed that neither pretreatment had any effect on the leukocyte picture. Both groups of animals show lymphopenia (P < 0.01) and polymor-



phonuclear leukocytosis (P < 0.01) 3 hr after the injection of epinephrine. A significant eosinopenia follows the injection of epinephrine in the saline-pretreated group (P < 0.01), but there is a significant eosinophilia in the vitamin-pretreated group after the injection (P < 0.05). All cellular elements, except the eosinophils of Group II, are back to normal by 24 hr after the epinephrine treatment. A slight eosinophilia still persists in the vitamin treated group.

Histological examination indicated that epinephrine stimulated the adrenals of the saline-treated (Group I) animals. Steroid depletion and sinusoidal depletion of ascorbic acid from the inner zones of the cortex are indicative of the alarm reaction (9). The adrenals of Group II animals were completely normal in appearance except for their increased content of ascorbic

acid.

The eosinophil and histological tests indicate that ascorbic acid pretreatment prevented signs of the alarm reaction in animals under the stress of epinephrine. It is noteworthy that the lymphocyte picture indicates stimulation of the adrenal cortex in both groups of animals. This is not substantiated by the histological tests. We have concluded that, in this experiment, the eosinophil test of adrenal activity proved to be more accurate than the lymphocyte test. This conclusion is supported by the observation that the lymphocyte response is not under complete regulatory control of the adrenal cortex; Dury (10) observed that the lymphopenia of stress does not occur in the splenectomized animal; in the same paper he stated that "the eosinophil therefore seemed most unequivocally, of the leukocytes studied, responsive to adrenal cortical activity alone."

Although the action of ascorbic acid observed in this experiment is very similar in some respects to that of some adrenal cortical hormones, there are certain points of dissimilarity that should be considered. Dugal and Therien observed that the vitamin prevented the hypertrophy of stress but did not cause atrophy of the adrenal; we have observed that pretreatment with the vitamin did not lead to changes caused by adrenal cortical hormones, e.g., lymphopenia, eosinopenia, and polymorphonuclear leukocytosis. In this latter respect the vitamin closely imitates the action of DCA, but it is not known whether this similarity is complete. It is expected that the DCA pretreated animal submitted to stress will not show the lymphopenia which we have observed in the ascorbic acid treated animals. It seems reasonable, therefore, in view of the findings of this experiment to assume a close relationship between the eosinophils and the amount of ascorbic in the organism. Whether this relationship involves transportation of the vitamin or some mass action process is not known. The problem is under further study in our laboratory.

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The Biological Performance of Osmotic Work. A Redox Pump

E. J. Conway

Department of Biochemistry and Pharmacology, University College, Dublin, Ireland

There is now much evidence for the view that when yeast in short-period fermentation produces a high degree of acidity the H+ ions derive from a change such as

 $CtH_a + 2M^{n+} \rightleftharpoons Ct + 2M^{(m-1)} + 2H^+$

and the same would appear to hold for the gastric parietal cell, as suggested by Conway and Brady (1) and followed by similar views advanced by Crane and Davies (2), by Patterson and Stettin (3), and by Rehm (4).

For yeast it also appears that the immediate process leading to the H+ ion formation takes place in an outer region which has been identified as the cell

The process occurs cyclically, which means that when the metal catalyst is again oxidized it has either to pass electrons through the inner membrane into the cell or else to pass there physically or to rotate in the membrane; and similarly with the cyclical reduction of Ct. The present communication is not concerned with the exact redox process that may occur, the main object being to indicate a relation between electrical and osmotic energy under such conditions, and the manner in which the relation might be used more generally than in the process of secreting H+ ions.

Relation between electrical and total energy change when a redox system of type CtH2 = Ct transfers hydrogen atoms to a metal system which retains only the electrons. It will be assumed that the two systems are in solution in different half cells, with liquid junction:

and that in each half cell of one-liter capacity there is the same HCl concentration. The platinum electrodes are joined to a source of emf which can be varied so as to allow no current to pass, or to pass very slowly and reversibly.

The electrode reactions are

$$A$$
) CtH₂ = Ct + 2H⁺ + 2e (1)

B)
$$2M^{\circ} + 2e = 2M$$
. (2)

The electrical work done, when a relatively very small

DUGAL, L. P., and THERIEN, M. Endocrinology, 44, 420 LONG, C. N. H. Recent Progress in Hormone Research, 1, 99 (1947).

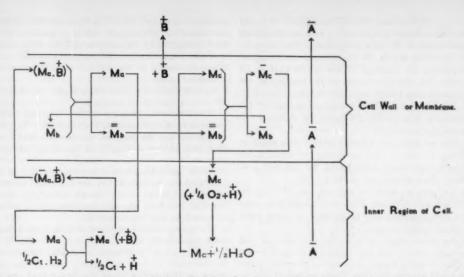


Fig. 1. The diagram indicates 3 oxidation-reduction cycles of the metal containing catalyst systems, M_{θ} , M_{θ} , and M_{θ} . Ms is the carrier system for the cation B^* (the oxidized form M_{θ} being reduced by a catalyst, CtH_x, of flavoprotein type, and binds the cation B^* . The catalyst system M_{θ} oxidizes the reduced M_{θ} and liberates B^* . The M_{θ} eyele is completed in the membrane or outer cell region, transferring its electrons to the system M_{θ} , which transfers them finally to the oxygen system within the cell. The anion A^* is carried out by the pd established by the active carriage of B^* . The diagram is one of many that could be used to illustrate the working of the redox pump, with active carriage of anions or cations, with and without H^* ion change.

amount of electrons (δ n), in relation to a large amount of reactants, pass from Chamber A to B, may be written.

At the same time δn equivalents of \mathbf{H}^+ ion is liberated into the half cell A, and there is an increase of $\delta n \mu_{\mathbf{H}^+\mathbf{1}}$ in the chemical potential of the \mathbf{H}^+ ions.

The total free energy of the H atoms in the system $CtH_2 \rightleftharpoons Ct$. An H atom in the system may be considered as made up of an electron and an H $^+$ ion, both at certain energy levels. The reference standard for the electron energy may be chosen as the standard hydrogen electrode and a solution containing H $^+$ ion at unit activity for the H $^+$ ion reference. The total energy of δ n atoms of hydrogen may then be written:

$$\delta n(St - FE_{A1} + RTlna_{H+1}),$$

where $a_{H^{+}1}$ is the activity of the H⁺ ions in the solution and St is a constant representing the sum of the two energy standards.

If δn electrons are now considered to pass through the cell with the half cells at any potentials E_{A1} and E_{B1} and H^+ ion activity of a_{H^+1} , the total energy of the H atom previously in the $CtH_2 \rightleftharpoons Ct$ system appears as

$$\delta n \{ St - FE_{B1} + F(E_{B1} - E_{A1}) + RTlna_{H+1} \}.$$

Since E_{B_1} may be regarded as a constant figure, unaffected by the H^+ ion level, nothing being varied in the systems but the H^+ ion concentration or activity, then the expression

$$F(E_{B1}-E_{A1})+RTlna_{B^{-1}}=a \text{ constant.}$$
 (3)

It appears therefore that, for the passage of unit quantity of electrons through such a cell, when the H⁺ ion concentration is increased the electrical work falls and the chemical potential of the H⁺ ions is increased in equivalent amount, to reach a maximum when the potentials of the half cells approach each other.

Application to the H+ ion excretion by yeast or parietal cells of the gastric mucosa. In this it is membrane and is capable of acting alternately in the outer and inner regions, with a metal receiving system similarly placed. A steady state is considered in which the electrons are carried through the outer region, from which they travel to the inner part of the cell and to a final acceptor. The terminal stage of electron transference is associated with an uptake of H ions from the cell, hydrogen atoms being thus transferred to the acceptor. In the outer region the H+ ions formed in the passage to the metal system (which transfers only electrons) accumulate with an equivalent amount of anions removed from within the cell by the pd established, or by active carriage.

In a steady state, if the passage of the electrons from the lower redox system to the higher were to occur wholly through the central region, on the one hand, or through the outer region on the other, the electrons beginning and ending in the same redox systems than

$$F(E_H - E_{Ott}) + RT lna_{H+1} = \xi + RT lna_{H+0}$$
 (4)

where ξ is the electrical work done on passing through the outer region.

Hence, it follows that

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In this we obtain an intimate picture of a transfer of energy by the cell, and the manner in which it can achieve a high concentration level for the cell constituent, which in this case is the H+ ion.

In the parietal secretion not only are H+ ions secreted but also Cl- ions. The enery required is relatively very small and may be assumed to derive from the same energy source.

Wider applications. It is in the extension of this idea of the redox pump, here treated in an exploratory way, that a wider insight into certain secretory processes would appear possible. Thus, instead of hydrogen ions and hydrogen atoms, we may consider as a possibility the excretion of an inorganic cation, such as sodium ion, and that this is actively excreted from a cell where it is in low concentration into a medium in which it is in much higher concentration, the cation excretion being accomplished by Cl- ions.

It will be supposed, but only for illustration, that this active excretion is being effected by a series of metal systems in the following way. The metals involved with their total protein complexes will be referred to as Ma, Mb and Mc (as in Fig. 1).

When Ma is reduced it may be assumed to expose a free or extra negative charge, and upon this Na+ is specifically adsorbed. The transit of the electrons may first be considered to occur within the cell from the Mb metal catalyst, on which there is no specific Na adsorption, finally to Mc, also within the cell and not in the wall or membrane; alternatively, the second metal catalyst may be assumed to exist in an outer region (cell wall), with the electrons passing through this system to reach the same destination as before; one may write

F(E₀ - E₀) + F(E_c - E_b) +
$$\mu_{N_0 \uparrow_{\lambda}} = \xi + F(E_c - E_b) + \mu_{N_0 \uparrow_{\phi}},$$
 (6)

 $F(E_b-E_a)-\xi=2RTln(Na)_o/Na)_i$ (7) and a similar result follows as treated above for H+ ion secretion, namely, the maximum value of $RTln (Na^+)_o/(Na^+)_i$ is $F(E_b - E_n)$. But here, instead of the relative concentration of Cl- ions being negligible compared with the Na+ ions, it may be assumed that it is of the same order and if, for example, they are equal in concentration then equation (7) becomes

 $F(E_b - E_a) - \xi = 2RTln(Na^+)_o/Na^+)_i$

or, when \$ approaches zero, then

 $F(E_b - E_a) = 2RTln(Na^+)_o/Na^+)_4$

If a computation be made of the value of (E, -E,

a difference of only 0.12 V is required for a 10 times concentrating effect. Such activity, however, would be counteracted by the entrance of NaCl from without, and the actual internal concentration of Na+ would come to depend on the balance of entrance and of active excretion.

In this cycle of events there occurs no change in H+ ions in the regions discussed.

The fractional passage of the electrons through metal catalyst systems other than through $(Ma^- \cdot Na^+)$ will lessen the efficiency of the process, which may thus have values ranging from the theoretical maximum to zero.

In the above treatment it is necessary only to suppose that the ion adsorbed on the catalyst is no longer osmotically active. Also, though specificity of adsorption has been assumed in presentation, actually this need be but little marked.

The system could be applied in turn to an arrangement whereby the ion is bound to the complex by the sharing of an electron, but since such an electron may be presumed to have an energy level of the same order as the sodium atom the process of transfer would pass over a very considerable energy barrier.

In the active absorption of K+ ions into yeast during short-period fermentation, the specificity of the absorption is about 20 times that of Na+ ions at a pH near 2.0, but only about 4-5 times at a pH of about 5-6. That sodium ions can be actively transferred in a more or less specific manner has been shown by Krogh (5), and Ussing (6), for the frog skin; and the above mechanism may be applicable to this transfer in yeast.

Active transport of anions. Lundegardh (7) has presented much evidence for the conclusion that anions are actively absorbed across root hairs by a redox mechanism, similar to that considered above, for active cation transport, and such views have been furthered by the experiments of Robertson and Wilkins (8). Apparently little specificity is associated with such anion transport in contrast to the high degree of specificity for active absorption in yeast.

Preceding such redox views were those of Lund and Kenyon (9) explaining the currents drawn from the surface of plant root and those of Stiehler and Flexner (10) for the movement of basic and acid dyes in the choroid plexus secreting cerebrospinal fluid.

In such hypotheses the movement of free electrons is required, and this, as many have pointed out, introduces a serious difficulty when dealing with nonmetallic conductors, though the movement is possible over molecular distances.

In Lundegardh's view, as in the mechanism described above, free electron passage is not required, and the catalysts may operate on each side of a membrane by rotation therein.

Interpreting the energetic association of electron energy with osmotic work in the manner described above for cations, a similar mechanism could be readily outlined, and will be described elsewhere.

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The efficiency of the redox pump. Franck and Mayer (11) in their theoretical development of the "osmotic diffusion pump" found that under the most favorable conditions there would be about a 30% efficiency, and a concentrating power of about 1.3 times, higher concentration ratios being possible with a layered series.

For the active secretion of H ions by the redox pump it will be seen from the above treatment that the immediate efficiency can approach 100%. Insofar as the electrons must be carried to some final acceptor, free energy may be lost in this process, and the overall efficiency much reduced. At the same time, the energy change involved in the further passage of the electrons could be negligible or utilized in another but quite different system.

Apart from its possible very high efficiency, the most attractive feature of the "redox pump" is the fact that the active carrier and the energy source are one and the same system.

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Effect of Aureomycin on the Respiration of Normal Rat Liver Homogenates

J. C. Van Meter and J. J. Oleson

Lederle Laboratories Division, American Cyanamid Company, Pearl River, New York

Recently Loomis (1) published a note to the effect that aureomycin specifically depresses phosphorylation without inhibiting respiration of normal mitochondria. Concurrently a study of the effect of aureomycin on enzyme systems of whole rat liver homogenates was in progress in this laboratory. In the course of this study it was found that the addition or omission of certain components in the basal medium of the system profoundly influenced the oxygen consumption in the presence of aureomycin. The basal medium used was essentially that of Pardee and Potter (2), with minor

The most marked effect was caused by the omission of citrate from the medium (Fig. 1). Without citrate

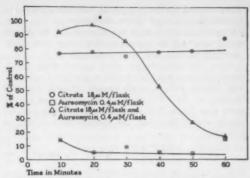


Fig. 1. Inhibition of respiration of rat liver homogenates by aureomycin

in the presence of aureomycin, respiration is virtually brought to a halt within the first 10 min of the incubation. By contrast in the presence of citrate, the rate of oxygen consumption does not start to decline until after 30 or more min of incubation. An additional 30 min must elapse before the oxygen uptake approaches the level of the citrate-free aureomycin preparation.

This suggests that a possible mode of action of aureomycin may be through blocking some part of the Krebs cycle. Studies to determine the probable sites of action are in progress in this laboratory.

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A Synthesis of 2-Desoxy-D-Ribose¹

Kiyohiko Ohta and Katashi Makino

Department of Biochemistry, College of Medicine, University of Kumamoto, Kumamoto, Japan

Recently we synthesized the 2-desoxy-D-ribose by the following route: Glucose → calcium gluconate → D-arabinose → D-acetobromoarabinose → D-diacetylarabinal → p-arabinal → 2-desoxy-p-ribose.

2-Desoxy-D-ribose.—D-arabinal was prepared according to Karrer and Becker (1), mp 81°.

$$[\alpha]_{\rm B}^{22^{\circ}} = \frac{+3.92^{\circ} \times 100}{1 \times 2} = +196^{\circ} \text{ (in water)}.$$

1.1 g of crystalline p-arabinal was dissolved in 18.3 ml of ice-cold 1.0 N sulfuric acid, and the solution was allowed to stand at 0°. It gradually became faintly yellow, and after 21/2 hr a faint turbidity occurred, accompanied by a flocculent precipitate. At this time the solution was soon neutralized with barium hydroxide and finally with barium earbonate. After removing the precipitate and barium carbonate, the clear and less colored filtrate was concentrated to a thick syrup under reduced pressure without heating.

¹ Aided by a grant from the Scientific Research Fund of the Department of Education.

Then we took up the syrup with absolute alcohol and treated it with about twice its volume of dry ether. The resulting precipitate was filtered and the filtrate was evaporated in a vacuum desiccator over phos-

phorus pentoxide and calcium chloride.

From the thick syrup after several days the 2-desoxy-D-ribose was obtained in crystalline form. This was washed with a small amount of cold n-propyl alcohol, mp 80°. The yield of the sugar was a little more than 0.3 g. The sugar gave a strongly positive Dische and Kiliani test. Its specific rotation was as follows:

$$[\alpha]_{D}^{22^{\circ}} = \frac{-1.13^{\circ} \times 100}{1 \times 2} = -56.5^{\circ} \text{ (in water)}.$$

Benzylphenylhydrazone.—0.3 g of 2-desoxy-D-ribose was dissolved in 1.5 ml of n-propyl alcohol, and 0.39 g of freshly distilled benzylphenylhydrazine was then added. After 3 hr in a desiccator over calcium chloride, the mixture had changed to a crystalline mass. It was washed with ether and recrystallized from n-propyl alcohol. Yield, 0.4 g. The substance melted at 129° (uncorrected).

 $\rm C_{18}H_{22}O_3N_2$ (314.2) Cale, N 8.92; found, N 8.94. Its specific rotation was

$$[\alpha]_D^{22^{\circ}} = \frac{-0.33^{\circ} \times 100}{1 \times 2} = -16.5^{\circ}$$
 (in pyridine).

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The Effect of Sensitization and X-Radiation on the Metabolism of I¹³¹ Labeled Proteins¹

F. J. Dixon, S. C. Bukantz, and G. J. Dammin²

Departments of Pathology and Medicine, Washington University School of Medicine, St. Louis, Missouri

Various methods of tracing antigens in animal tissues have been employed since Metchnikoff's first titrations (1897) of tetanus toxin localized in mouse tissues (1). Among other nonradioactive agents that have been used as tracers are arsenic-proteins (2), iodinated serum (3), colored antigenic proteins prepared by azo conjugation (4-7), and fluorescent antibodies prepared by isocyanate conjugation (8). Since the introduction of radioactive isotopes into medical research, several such compounds have been so employed. Tobacco mosaic virus tagged with P32 has been traced in mice (9), I131-tagged antibody has been traced in rats and mice (10), and I131-tagged proteins have been traced in guinea pigs (11). The radioactive isotopes lend themselves extremely well to quantitative work and to studies of tissue localization by radioautography.

¹ This work was supported by grants from the Atomic Energy Commission and from the U. S. Public Health Service.

² The authors wish to acknowledge the capable technical assistance of Mary C. Johnson and Maria P. Deichmiller.

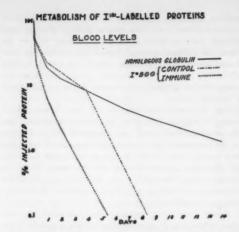


Fig. 1. Elimination curves for I*BGG in normal control and immune rabbits and homologous globulin (I*RGG) in normal control rabbits.

In particular the I131 label is desirable because:

 It can be attached to proteins in traceable amounts without measurably altering their immunologic specificity.

2. Available evidence indicates that the I^{ss} protein bond is a stable chemical link which in vitro resists wide changes in temperature and pH, salt exchange dialysis, prolonged storage and enzymatic action (11, 18). In vivo it appears that the iodine remains attached to the protein as long as the latter is immunologically detectable.

3. Prompt exerction of the I* label liberated by antigen metabolism can be accomplished by iodine prefeeding

to saturate the iodine-utilizing tissues.

4. The I* liberated by protein metabolism is not appreciably incorporated either by synthesis or interchange into the rabbit's own proteins as determined by activity measurements of plasma protein fractions after administration of I* labeled homologous globulin. Furthermore, I* injected as inorganic iodide into iodine-prefed animals is rapidly exereted unchanged in the form of iodide. In contrast, the injection of I* attached as a protein label is followed by the exerction of nonprotein organic combinations of I*, probably diiodotyrosine and perhaps other amino acid forms, as well as iodide, suggesting actual protein degradation prior to liberation of the iodine label. This difference in exerction forms was determined by paper partition autoradiograms (13).

Labeled proteins were injected intravenously into 2-kg rabbits as follows: Labeled homologous globulin (I* RGG) to normal rabbits; labeled bovine γ globulin (I* BGG) to normal rabbits in amounts of 500, 75, or 1 mg; 75 mg I* BGG to rabbits immunized 20 days earlier by an intramuscular injection of 325 mg bovine γ globulin adsorbed on aluminum hyroxide; 75 mg I* BGG to rabbits, 48 hr following their exposure to 500–600r of 200 kv whole-body x-ray; 10 mg I* BGG to normal mice; and 90 mg I* BGG coupled with diazotized p-aminobenzoic acid (P-AP*) to normal rabbits.

All tracer studies were done by β -counts of dried $^{\circ}$ I* hereinafter refers to I²⁰⁰.

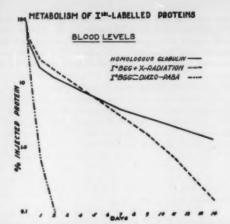


Fig. 2. Elimination curves for homologous globulin (I*RGG) and P-AP* (I*BGG-diazo-PABA) in normal control rabbits and I*BGG in x-radiated rabbits.

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blood or plasma, homogenized tissue, urine, and protein-free supernates of blood and urine, with corrections for self-absorption of samples when necessary. Quantitative microprecipitin (14, 15) determinations of immunologically active protein in the blood agreed with protein-bound radioactivity. Tissue antigen concentrations were calculated by determining tissue hemoglobin and then subtracting from whole tissue activity that activity due to contained blood.

Blood levels. The rate of disappearance of labeled protein from the blood proved to be relatively constant and characteristic for each experimental group. The disappearance rate of I*RGG provides a base line for comparison with the other rates (Fig. 1). There is a rapid fall in blood activity during the first 24 hr after injection, at the end of which time approximately 20% of the original injection remains in the blood. This rapid drop within the first day is probably in part caused by mixing of the labeled protein with the extravascular, extracellular proteins, or "lymph proteins" (16). Equilibrium of labeled globulin in serum and lymph protein is apparently established by 24 hr. After this "dilution phase" there is a gradual straight line loss of labeled globulin from the circulation, which we have termed the "nonimmune elimination phase."

The blood disappearance curve for all doses of I* BGG (1-500 mg) in normal rabbits during the first 4 days closely resembles the curve with I* RGG. After 4 days, however, and just preceding the appearance of circulating antibody, the rate of antigen elimination from the blood becomes more rapid and continues so until the ninth day, when less than 0.1% of original injected protein can be found in the entire blood volume. This rapid third phase we have termed the "immune phase."

Immunized rabbits eliminate I* BGG from the blood much more rapidly than controls. There is apparently a simultaneous action of dilution and immune elimination during the first 24 hr, followed by immune elimination exactly paralleling that found in normal rabbits from fourth to ninth days. In immune rabbits, circulating antibody was present before injection of antigen. Less than 0.1% of the original injected protein could be found in the entire blood volume on the sixth day. Fig. 1 presents a comparison of disappearance curves for I* RGG in normal rabbits and I* BGG in normal and sensitized rabbits.

X-radiation apparently interfered with the development of an immune state, as shown in Fig. 2. The dilution and nonimmune elimination phases for the irradiated group are identical with those of the normal group for 4 days. In the irradiation group, however, an immune elimination rate fails to develop after the fourth day, the elimination rate resembling that of I* RGG for several additional days. The rate of disappearance gradually increases and approaches the immune rate. Circulating antibody was demonstrated in only a small proportion of the irradiated animals by the fourteenth day after injection.

P-AP° disappears from the circulation of normal rabbits at a rate more rapid than any of those previously described. In 2 days less than 0.1% is found in the entire blood volume (Fig. 2).

Urine excretion. Total urine collections were obtained in standard metabolism cages. The rabbits receiving I° EGG excrete, in the urine, a major portion of the injected activity in the form of radioactive iodide and smaller amounts of organic iodine combinations. None of the activity in urine is protein-bound, and antigen cannot be detected serologically. The rate of appearance of radioactivity in the urine reflects the rate of elimination from the blood. In the immunized group, 50% of the injected activity is found in the urine by the third day, in the control group by the fourth day, and the x-radiated group by the sixth day.

Normal mice injected with 10 mg of I° BGG excrete 70% of the injected dose of activity in the form of nonprotein-bound I° within 3 days.

I° excretion by rabbits given P-AP° is slower than after I° BGG injection. This slower excretion we found related to tissue retention of the P-AP°.

Tissues. When I* BGG is used as the antigen, there is no selective uptake or retention by any particular organ or tissue. The tissues vary somewhat in antigen content, but the levels of antigen concentration never exceed that of blood except in rabbits dying in anaphylaxis. The antigen content of blood and tissues diminishes at an almost equal rate, suggesting that the tissue content is dependent on the blood level. Estimated total carcass antigen values for normal rabbits on the ninth day and immunized rabbits on the sixth day are in the range of 0.3–0.5% of the original injection. Lung, liver, and heart yield slightly higher antigen levels than other organs. There is no apparent uptake or retention of antigen by mesenteric lymph nodes, spleen, or appendix.

In fatal anaphylaxis there is rapid loss of activity

from the blood and rapid accumulation in the lungs, occasionally to more than 8 times the concentration noted in the blood. Tissue autoradiographs reveal that the major portion of the antigen is concentrated in homogeneous, eosinophilic, intravascular masses. There is a similarly rapid but less marked accumulation in the liver, never exceeding 1.5 times the concentration in the blood.

P-AP° is rapidly lost from the circulation, 0.1% of injected protein remaining after 48 hr. In spite of this precipitous drop, the tissues studied (liver, spleen, lung, heart, kidney, appendix, and lymph node) contain significant amounts of radioactivity at 48 hr. Tissues highest in P-AP* content are the spleen, liver, and lymph nodes. Less marked retention is found in lungs and kidneys. At 10 days, the only tissues measured-spleen, liver, kidney, and lymph node-still retain radioactivity. Antigen retention is never observed when I* BGG is used, except in fatal anaphylaxis.

The data reported support the view that I* is a valid protein label in vivo. That is, after I° protein injection, protein-bound Io in the body fluids and tissues represents the originally labeled protein, whereas nonprotein-bound radioactivity indicates catabolism of the originally labeled protein. Characteristic curves of elimination of protein-bound activity from the blood are observed for each of the experimental groups described, and each shows a remarkable constancy. Specific phases, representing rates of elimination, can be identified as components of the curves. The manner of elimination of I* RGG from the rabbit's circulation resembles, in general, the curve of elimination obtained following injection of similar proteins labeled with C14 and N15 (16). Thus, I*-labeled proteins are handled like those proteins in which the radioactive label is more intimately incorporated into its molecular structure.

The I° BGG, irrespective of size of dose, leaves the blood stream of the normal rabbit rapidly, less than 0.1% of the injected dose being present at the ninth day. Antibody appears on the seventh day, rises, and persists after antigen is no longer detectable in the blood or tissues. The blood level of I * BGG in immunized rabbits drops more rapidly than in normal rabbits; in x-radiated, more slowly than in normal rabbits. The degree of active immunity determines the

characteristics of the elimination curve. Rapid disappearance of I BGG from the blood is reflected in rapid appearance of I* as iodide and in

organic but not protein combination in the urine. Further evidence that disruption of the protein molecule occurs is suggested by the observation that both organic and inorganic combination of I* are excreted. Normal mice given I* BGG behave essentially like normal rabbits with reference to the rapid excretion of nonprotein-bound activity in the urine.

No retention or selective localization of antigen in the tissues has been observed in rabbits given Io BGG. The fall in tissue content of antigen roughly parallels that of the blood. In immunized rabbits not dying in anaphylaxis there is no particular tissue localization, but the lungs, liver, and myocardium contain more activity per gram of blood-free tissue than do the spleen and appendix. In fatal anaphylaxis, antigen is rapidly lost from the blood and accumulates primarily intravascularly in the lungs.

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In contrast with the above findings with I* BGG, we observed P-AP° to leave the blood more rapidly. less than 0.1% of the injected dose being present at 48 hr. Moreover, less activity appears in the urine and more is retained in the tissues, particularly the liver, spleen, and lymph nodes. The appendix, although a lymphoid tissue, does not respond in the same manner as the spleen and lymph nodes to foreign proteins labeled in this manner. Thus, P-AP*, though a soluble protein conjugate, is metabolized differently from lightly iodinated proteins, in that it is removed from the blood more rapidly and deposited in the reticuloendothelial system.

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Comments and Communications

Problems of Translation

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IN THE September 15 issue of Science (112, 317 [1950]) Joseph E. Williams, of the Stanford University Department of Geography, presents a justifiably favorable review of the recent American edition of L. S. Barg's Natural Regions of the USSR. Similarly favorable reviews have appeared in the New York Times (June 18, 1950), the San Francisco Chronicle (July 23, 1950), and perhaps in other publications that have not come to the attention of the present writer. Those interested in opinion concerning the original text may consult R. M. Fleming's report in the Geographical Review for April 1938 (28, 351). Reviews of the recent American edition overlook certain aspects of its production that are exceedingly important for a proper understanding of the strength, the weakness, the direction of development, and the content of Russian scientific publication. With this in mind, the following comments are offered.

We pride ourselves on being the best-informed nation in the world. Nevertheless, Natural Regions of the USSR was first published in Russia in 1937, there was a second Moscow edition in 1938, and a French translation appeared in Paris in 1941; not until nine years later do we have the first English translation (13 years subsequent to the original appearance of the book). The question arises: How much more of this type of material is available, waiting to be made current through translation? The answer: A great deal. Harry Schwarz (Times, June 18) makes the following statement about this book:

How wide the gulf is between the Soviet Union of 1950 and that of 1937 is porhaps most clearly indicated by the fact that this volume has no sycophantic adulation of Stalin or quotation of his works, while it has at least one acknowledgement of a geographic discovery by an American naval officer. If it were being published today for the first time in the USSR—an unlikely event in view of the obvious military usefulness of this volume—these "'deficiencies'' would no doubt have been rectified.

Mr. Schwarz creates a false impression. It is remarkable that war, with all its dislocations and political pressures, has not had a more deleterious effect upon the amount of Russian publication in the scientific fields, more especially those dealing with geography and related subjects. A case in point is Geografia Zhivotnyx ('Animal Geography'), by Bobrinskii, Zenkevich, and Birshtein, a general textbook drawing widely on the literature of all nations (and giving credit where credit is due), which appeared in Moscow in 1946. If the Russians draw freely upon our work and we fail to consider theirs (a process which seems to have been going on for some time now) they will, in due course, be better informed than we are. All the self-satisfaction in the world will not compensate for our neglect of foreign literature.

As J. A. Morrison (chairman of the Administrative Committee of the Translation Project of the American Council of Learned Societies) points out in his preface, Olga Adler Titelbaum has done a stupendous job in translating the text under review. A careful comparison of the original with her translation reveals much evidence of keen scholarship. Comparing Mrs. Titelbaum's work with the French text, it is the opinion of this writer that, although the French may read more smoothly and be of a more polished style, it does not come up to the standards of accuracy set by the American edition. Furthermore, the French text lacks indices, glossaries, and numerous illustrations and maps that render the American volume very useful. Even so, the American volume is by no means as good as it could and should be. The student who uses Natural Regions of the USSR, be he college freshman or highly trained geographer, must bear in mind the limitations of this study as an authoritative source book. It contains a fair amount of misinformation and lack of clarity born of language difficulties. These difficulties are general in the translation of scientific Russian into English. Although elementary, they represent a surprisingly effective barrier to the accurate English rendition of Russian scientific literature. For present purposes these difficulties are divided into three major categories: simple translation error, editorial error or style obscurity, and typographical error. Under the heading of translation error one can recognize four distinct types, described briefly below with examples from the handling of animal names. The advantage of using animal names in this connection is threefold: they are simple noun forms not easily affected in meaning by sentence structure; they refer to demonstrable elements of nature that can be studied in pictures, specimens, and other nonlinguistic media; and, most important of all, every animal bears a more or less universally accepted scientific (Latin) name allocated on the basis of international rules to which all zoologists adhere.

- 1. The first translation error is not understanding the meaning of a term in the language from which the translation is being made (Russian). Vertlyavy dyatel is rendered as 'wryneck.' This word actually refers to the middle spotted woodpecker (Dryobates medius), a related but very different species. The present reviewer spent several hours running down the correct translation. With 2,000 (more or less) similar terms to work with, Mrs. Titelbaum could scarcely be expected to put in a day or so on each one.
- 2. The second translation error is not understanding the meaning of terms of the language into which the translation is being made. A fairly systematic error of this sort is the mixing of British and American common names with no indication as to which is being used. Most specialists have both sets of terms in mind and can properly interpret as they read. The beginning student, however, is led badly astray. The following is a condensed

example. The words blackbird, robin, and elk are used to refer to the species Turdus merula, Erithacus rubecula, and Alces alces. This is British usage and quite proper. The species concerned occur in Europe but not in America. However, the American words blackbird, robin, and elk refer to entirely different species: the blackbirds are any one of a number of species in the family Icteridae; our robin is specifically Turdus migratorius; our elk is any one of a number of species within the genus Cervus, more especially C. canadensis. On the other hand the American terms willow ptarmigan and brant have been used to designate the species Lagopus lagopus and Branta bernicla, which will be found in British literature under the names willow grouse and brent goose. By not adhering definitely to the British or the American usage an area of confusion is left open to the student, who will, rather than take the trouble to get the background necessary to understand this nomenclatural dualism, dispose of the matter by concluding that either author or translator is not deserving of full confidence.

3. The third type of translation error is the rendition of a specific term with a general equivalent. The Russian gus-gummenik has been rendered 'wild goose.' There are a dozen species of wild goose occurring in the Soviet Union (slightly more or less according to your interpretation of what constitutes a goose). The term wild goose has no specific reference in either the American or the British literature. The immediate inference is that Professor Berg has handled his bird names loosely and does not intend to make specific reference. Such is not the case. Gus-gummenik refers to the bean goose (Anser fabilis)

and should have been so rendered.

4. The fourth type of translation error is the misleading literal translation. The Russian polevoi vorobei is rendered literally 'field sparrow.' The American field sparrow is an entirely different species which does not occur in Eurasia. The British, as far as can be discovered, use no such term as field sparrow. Polevoi vorobei actually refers to Passer montanus, known to the British as 'tree sparrow.' Insofar as the term tree sparrow is preempted in America by another strictly New World species, about the only way out of the problem would be to render polevoi vorobei as 'European tree sparrow,' the title under which this bird usually makes its appearance in American publications.

Under the heading of editorial error and style obscurity come such matters as inconsistency in the translated form of Russian proper names and specialized terms, the preparation of glossaries, indices, and figures. One or two examples will suffice to illustrate. On page 9 we find the following: "Vaigach Island, separated from the continent by Yugorsky Shar ('strait') . . ." Shar is a word of North Coast origin meaning strait. On the following page we find: "Some 30 or 40 kilometers from Matochkin Shar, on the southern island, glaciers begin to appear." A little further on: "Kostin Strait contained more islands in 1924 than are indicated on old maps." The word shar does not appear in the glossary. Scrupulous adherence to the Russian text appears to have eaused this terminological inconsistency where the idea of strait is rendered in three different ways. Meticulous following of the text is considered a virtue, and it may well be, but the other side of the question should be considered. Russian students know the meaning of the

word shar at about the same level as Americans know the meaning of the Scotch word lock ('lake'). The modern and widely used Russian word for strait is proliv. The interplay of shar and proliv in the Russian text results in a pleasant style effect without loss of clarity. In the English the contrary is the case. It would have been better to reduce these three geographic terms to their least common English denominator and render them as: Yugorsky Strait, Matochkin Strait, and Kostin Strait. In different forms this same problem recurs throughout the text. The Russian word raion is frequently retained in italics. Where it is not handled in this way it is rendered by various appropriate English equivalents such as region, vicinity, or near. The glossary definition of the retained word raion is good as far as it goes, but does not indicate that the word has more than administrative meaning, being used by the Russians with about the same scope (not necessarily congruent) as the American term territory (as in breeding territory of the grouse, Territory of Alaska, territory around Boston). The Russian term suslik is retained. The word is broadly understood by European mammalogists; it is the subject of a translator's note; it is also included in the glossary. On the other hand, it is one of the few animal names for which we have a nearly exact English equivalent; e.g., 'ground squirrel.' The words toltry, grivy, kolki, and others are retained in italies, explained at the point of first introduction, but not included in the glossary. Using the book as a reference, one turns to page 150 to read about vegetation on elevated portions of the desert zone. We find polyn, boyalach, and biyurgun growing there in italies. Of these retained words only one, polyn, is explained in the glossary. Explanation of the other two appears in the text on page 149. Apparently the frequency of occurrence, importance, and juxtaposition to text explanation have figured in deciding whether or not retained Russian words are given a place in the glossary. Retained words should have been reduced to the number of those that have no satisfactory English equivalents. More important, every retained word should be included in the glossary.

The category of typographical error scarcely needs comment. Proper names should always be proofread most carefully in scientific work. "Rosa's gull" should appear as Ross's gull. Felix, comic strips to the contrary notwithstanding, should be Felis. The volume in hand lacks a list of errata, which would be useful.

The use of italics may be classed as either an editorial or typographical problem. In the course of an interesting discussion on the development of the Black Sea, the terms Neo-Euxine and Karangatsk are used eight times, the latter appearing twice in Roman and twice in italic type, the former appearing once in italic and three times in Roman type. The Russian text has been followed with respect to type style. The question immediately arises: What to do with a retained Russian word which was italicized in the original text? Double italics? Then again, if we follow Russian type style,

what shall we do with Latin scientific names which the Russians, because of the contrasting Cyrillic alphabet of the text proper, render in Roman type? Italies, parentheses, quotes, and diacritics in general are useful tools in scientific writing and in translating. In translating scientific writing, however, unless they are held to a minimum, they rapidly become so abundant and superimposed the one on the other that they lose meaning. The term kara-dzhusan is rendered in italics within parentheses. In the original text it is in standard Cyrillic within quotes within parentheses.

A more serious misuse of punctuation is the inclusion of translator's comments sometimes within brackets and sometimes within parentheses. We find that the translator's additions are helpful, but they most certainly should have been consistently included within brackets (per conventional procedure). The inclusion of translator's comments within parentheses throws a shadow of doubt on the source of every bit of parenthetical material throughout the book-a considerable

quantity of data, by the way.

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What do these comments concerning translation technique add up to? The American Council of Learned Societies has produced a soft translation, which cannot be used freely as an authoritative source book. There is much evidence that Mrs. Titelbaum was not only aware of the problems mentioned above, but also made special efforts to solve them. From outside looking in, it appears to this writer that she did not have adequate facilities (including time and specialist cooperation as among the most important) to produce a firm translation. A carefully revised edition, involving extensive specialist cooperation, would render this volume an extremely useful classic in the field of geography and, what may some day prove more important, a broad steppingstone toward the solution of the general problem of intelligently studying the Russian scientific literature by means of translation.

DAVID G. NICHOLS

Berkeley, California

Colloid Osmotic Pressure

IN THE preparation of his interesting paper on "A Rational Method for Calculating Colloid Osmotic Pressure of Serum" (1), R. H. Kesselman has probably overlooked several previous publications related

to the subject.

1. Dr. Kesselman states that "a fall in serum sodium produces a rise in serum colloid osmotic pressure," and that "this is an observation not previously emphasized and is a consequence of the Donnan equilibrium." Even if no significance is attached to some certainly erroneous or exaggerated statements (2), the influence of the sodium concentration on the colloid osmotic pressure in vitro was observed more than 20 years ago (3) and has already been explained as a consequence of the Donnan equilibrium (4). As the activity of the indiffusible serum ions is always very small in comparison with the activity of the diffusible

ones, however, this influence is very slight-much slighter than results from Dr. Kesselman's calculations. As for the situation in vivo, it was already known that the colloid osmotic pressure of the serum increases during low salt diet (5) and is lowered by oral administration of sodium chloride (6) but in the observations mentioned, these effects were independent of the serum sodium level and probably were due to

variations of the serum proteins only.

2. Nearly 20 years ago (7) I pointed out that the empirical relations between the protein content and the colloid osmotic pressure of serum established by von Farkas (8), Govaerts (9), and others (10) cannot reflect reality, because all these equations are based on the erroneous assumption that the osmotic pressure exerted by each gram of albumin or globulin is independent of the total protein concentration. The same objection holds against Dr. Kesselman's rationally derived formula: neither the law of partial pressures nor Van't Hoff's law applies to lyophilic colloidal systems.

Verney (11) found a strong analogy between the behavior of the colloid osmotic pressure during variations of the serum protein concentration and the Van der Waals equation, and stated that p(v-b) = K, p being the colloid osmotic pressure, v the reciprocal value of the protein concentration, and b and K constants. After having shown by measurements of the colloid osmotic pressure of serums concentrated by ultrafiltration and diluted with ultrafiltrate that Verney's equation is a correct expression of the facts (12), I was able to demonstrate (13) that the values of b and K depend essentially on the albumin/globulin ratio (q) and to derive an equation

 $p[v-0.0182(q-1.39)^2-0.0415] = \sqrt{q+0.2}+2.185$

and construct a nomogram, both of which permit one to determine the colloid osmotic pressure with an error of less than 5%.

PAUL D. MEYER

Universidad Católica de Chile and

Laboratorios Lumière Americanos Ltda. Santiago de Chile

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Book Reviews

Inberitance in Dogs: With Special Reference to Hunting Breeds. Ojvind Winge; Catherine Roberts, translator. Ithaca, N. Y.: Comstock, 1950. 153 pp. \$3.50.

This is an excellent book for the professional geneticist, and for dog breeders with previous education in genetics or advanced biology, with many points of

genetics or advanced biology, with many points of superiority over some of the books on dog breeding. The first 32 pages will be grasped by the lay dog breeder, but, from this reviewer's experience, beyond that he will find the genetics too complicated.

The name suggests a wider coverage of breeds than one finds in reading the book. Only the setter, pointer, cocker spaniel, wire-haired fox terrier, and dachshund breeds are considered, whereas the hunting breeds

cover a vastly wider field.

The data were drawn chiefly from European sources, and it is obvious that the author has failed to review many of our American sources, just as we often neglect the European, principally because of language difficulties.

The book is illustrated with five excellent plates, depicting color phases of the various breeds discussed. The translation is outstanding, particularly in the fact that the European breed names have each been explained in parentheses so that we may know the characteristics of these breeds.

The author has designated the genes with letters, not all of which correspond to the letters used in America in describing similar traits, but for use in

explanation they serve very well.

Every owner of the above-mentioned breeds would do well to own a copy of this book, and many dog breeders and geneticists will want it for their shelves. LEON F. WHITNEY

Whitney Veterinary Clinic

Principles of Nuclear Chemistry. Russell R. Williams, Jr. New York: Van Nostrand, 1950. 307 pp. \$3.75.

This new book, written to meet the needs of a one-semester introductory lecture course on the chemical aspects of radioactivity for senior and graduate students at Notre Dame, is certain to be welcomed by instructors everywhere who wish to teach the elements of this subject. Compressed into some 300 pages the student will find an outline of pure and applied nuclear chemistry clearly and succinctly presented in nine well-organized chapters. The first five of these lay the necessary physical basis for an understanding of radioactivity. A set of numerical exercises serving both to illuminate the text and to encourage reading beyond its pages concludes each of these chapters. A carefully selected supplementary reading list is also appended to every chapter.

In view of the research interests of the author and his colleagues at Notre Dame, it is not surprising that the distinguishing features of the book are its authoritative chapters on the chemical consequences of nuclear reactions, and on the chemical effects of nuclear radiations. The material here discussed approaches the actual frontiers of the science, and the reader's interest cannot fail to quicken with the sense of the richness and variety of chemical phenomena arising from the effects of radioactivity. The last chapter of the book reviews the subject of applied nuclear chemistry, a topic so broad that it could be expanded into a treatise. Here again there has been an excellent selection from a large and rapidly increasing number of very diversified studies ranging through all the important branches of chemistry.

Unquestionably this book will be widely useful, Certain deficiencies of arrangement and presentation will be noted, therefore, that these may be considered in possible future revisions. The absence of a unified discussion, in the early portion of the text, on the interaction of nuclear radiations with matter is perhaps the most evident shortcoming of the book. A treatment of this subject logically precedes any consideration of devices for the detection of unstable nuclides, of absorption methods for decay energy estimation, or of the subject of radiation chemistry. Further, the closely allied topics "Devices for the Production of Unstable Nuclides" and "Nuclear Bombardment Reactions" seem unnaturally divided between Chapters III and V. The discussion of the artificial elements is likewise split. Possibly sufficient material will soon be available to make possible the inclusion of a complete chapter on the synthetic elements, thereby increasing the chemical flavor of the book. Mention of such topics as the chemical separation of nuclear isomers, coincidence counting techniques, high-energy spallation reactions, photographic plate techniques for nuclear reaction studies, and the betatron may not be inappropriate in an introductory text. Similarly, some brief description of health-physics instruments seems desirable, as would a table summarizing the present consensus as regards radiation dosage tolerances. Unfortunately the otherwise quite readable text is marred by numerous (though minor) typographical errors. The statements (p. 120) that "K40 emits both positrons and negative beta particles" and (p. 135) that RaE is "a beta-emitter of 22-year half-life" are of course obviously incorrect. A short appendix to the book contains, in addition to listing of the numerical values for the fundamental constants and mass-energy conversion factors, a periodic table of the elements and a very useful nuclide chart.

All things considered, however, the author is to be congratulated on the preparation of a highly teachable introduction upon which the instructor can enlarge according to the needs of his students, or to the objective of his course. The very reasonable price of the book may be a further attraction.

G. E. BOYD

Chemistry Division
Oak Ridge National Laboratory

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Pathologic Physiology: Mechanisms of Disease.
William A. Sodeman, Ed. Philadelphia: Saunders,
1950. 808 pp. \$11.50.

There is an evident need for a reference or textbook providing an integrated view of physiology, physiological chemistry, and medicine for medical students and physicians. It appears that the 24 authors of this collection of essays have made a considerable effort to fill this need and to bridge the gap between textbooks

of medicine and those of physiology.

The book is divided into nine main sections, each of which contains one or more chapters on pertinent topies. For example, in the first section, which covers the circulatory system, the chapters describe hemodynamics and blood vessels, structure and properties of the heart muscle and its blood supply, the cardiac cycle, the electrocardiogram, cardiac output in health and disease, congenital heart anomalies, and, finally, cardiac failure. The sections that follow are respiratory system; digestive system, including the liver; blood and spleen; urinary tract; endocrine glands, water balance, and nutrition; locomotor system; infectious diseases and allergy; and physical and toxic chemical agents.

The emphasis in these chapters is on the presentation of the underlying physiology and the relationship of deranged physiology to symptomatology. The authors have, however, chosen what appears to be a general and somewhat diffuse approach in their discussion. With respect to the more purely physiological aspects there are some excellent chapters, particularly those on the heart, the liver, the joints, and the endocrines. The discussion of edema could be better systematized, however, and a much more extensive discussion of renal disease would be useful. The authors are careful to mention, for example, the various possibilities of electrolyte disturbances that may occur in terminal nephritis, but no data are given on a specific case nor is quantitative information presented. In the discussion on cardiac failure, it would be helpful to have data on cardiac output, venous pressure, renal function, and electrolyte and water balance for a patient in cardiac failure, and then give the results of serial examinations during the illness and through compensation. A distressing aspect of the book is the inadequate treatment of acid-base disturbances and their control. What physical chemistry there is, is primitive; some of it is inaccurate (the phosphate system is not one of the two important buffering systems of the blood). Reference to a more modern text than this is advisable for these topics.

In general the book is up to date; references are adequate, though occasionally some work cited in the

text receives no literature reference in the bibliography. The technical make-up of the book is satisfactory, but the small type and the page size are such that it is difficult to read. More liberal use of charts and diagrams in certain chapters would have led to considerable improvement.

In conclusion, it appears that this text may be found useful for those who seek a descriptive and qualitative survey of some of the interrelationships of physiology and clinical medicine.

FRANCIS P. CHINARD

Department of Physiological Chemistry The Johns Hopkins School of Medicine

Nuclear Data. Compiled by the National Bureau of Standards Nuclear Data Group. Washington, D. C.: U. S. Government Printing Office, 1950. 309 pp. \$4.25, including future supplements.

This impressive piece of work is a collection of nuclear data which meets a longfelt need among workers in the nuclear field. Started by Katharine Way some years ago at the Oak Ridge National Laboratory, the volume has now been completed by Dr. Way, Lilla Fano, Millicent R. Scott, and Karin Thew under the editorship of the National Bureau of Standards. Many other competent specialists contributed to this comprehensive compilation of nuclear data containing experimental values of half-lives, radiation energies, and decay modes of radioactive isotopes, of relative abundances, nuclear moments, and cross sections of stable isotopes. Decay schemes and level diagrams are presented wherever they seem to be well established. Mass values have not been included since there is a comprehensive collection of these values available in the well-known Isotopic Report of Mattauch and Flammersfeld. The material is well arranged. References to original papers are given with every nuclear constant collected in the volume, and in cases where a nuclear property can be measured in different ways, the method used is indicated together with the reported value.

One major limitation in making a compilation of nuclear data generally available at present is imposed by the fact that the increasingly large number of measurements of nuclear constants reported each month makes it difficult to keep such a work up to date. In fact, a collection of nuclear constants is already incomplete at the moment the tables become available. The National Bureau of Standards nuclear data tables are the first that will remain current, with supplementary additional sheets of new information to be issued at six-month intervals. The loose-leaf binding of the tables makes the incorporation of the supplements simple. Sufficient space is also provided for additional remarks by the user, since the tables are printed on one side of the sheet only.

In reviewing this volume one is led to make a comparison with previous tables such as the *Isotopic Re*port by Mattauch and Flammersfeld and the Seaborg tables in which, generally, one best value for a given nuclear property has been critically selected. In Nuclear Data, similar information from different sources is presented, leaving it up to the reader to make a critical choice by a study of the original papers. This is certainly useful and stimulating for specialists in the field of nuclear physics, but may cause some difficulties for the reader who is not familiar with nuclear methods. The new compilation is not only more complete than any previously published table, but it is also more comprehensive, containing many additional data such as conversion coefficients, thresholds, and information about measurements of the shape of β-spectra, and of angular correlation.

Nuclear Data should prove exceedingly useful for any worker using radioactive isotopes. The physicist or chemist engaged in nuclear research is certain to be grateful that the tedious but necessary work of compiling nuclear data and keeping it up to date is being carried on by the National Bureau of Standards Nuclear Data group and that it is to be continued.

ROLF M. STEFFEN

Physics Department Purdue University

Reviewed in Brief

Methods in Food Analysis Applied to Plant Products. Maynard A. Joslyn. New York: Academic Press, 1950. 525 pp. \$8.50.

This book is intended as a text and reference work on the physical and chemical methods used in laboratory examination and evaluation of commercial fruit and vegetable products. It is based on the lecture notes and laboratory directions developed by the author in the presentation of a course in food analysis over a period of 20 years. As it is at an advanced level, previous training in analytic and organic chemistry is assumed. The methods presented are those in common use. Each chapter has an extensive list of references that will be a great aid to students. The text may be highly recommended.

Plastic and Reconstructive Surgery: A Manual of Management. Ferris Smith. Philadelphia-London: Saunders, 1950. 895 pp. \$15.00.

"The purpose of this manual is directive. It is not to teach the beginner in this special field, except through a preceptor who has basic training, experience and competent judgment." The author has drawn on his wealth of experience to present, with numerous preoperative and postoperative photographs, the trends in plastic surgery since World War I. As one scans the captions of the 14 chapters there is an impression of unbalance; however, it is clearly stated in the preface that hypospadias and epispadias should be corrected by the urologic surgeon, absence of the vaginal tract by the gynecologist, and lesions of the tendons, nerves, and bones by the orthopedist.

The book is authoritatively written and well printed.

The author has unquestionably achieved his goal. This volume should be in the hands of everyone interested in this highly specialized field of surgery.

Progress in Biophysics and Biophysical Chemistry, Vol. I. J. A. V. Butler and J. T. Randall, Eds. New York: Academic Press; London: Butterworth-Springer, 1950. 279 pp. \$6.80.

In the face of an ever-mounting mass of reviews in the many fields of biological science, the editors of this volume are to be congratulated on having obtained, in general, critical reviews rather than mere bibliographic compilations while at the same time limiting their book to a modest 279 pages. The subtitle, "Biophysical Chemistry," is most appropriate to the subject matter since about half the chapters deal with the

physical chemistry of large molecules.

The chapter headings are as follows: "Properties of Solutions of Large Molecules," H. Gutfreund; "Fundamental Structures in Biological Systems," K. M. Rudall; "Scattering of Visible Light and X-Rays by Solutions of Proteins," G. Oster; "Bioelectric Potentials, Their Maintenance and Function," E. E. Crane; "Phase Contrast Microscopy," A. F. W. Hughes; "Local Refractometry," J. St. L. Philpot; "Soft X-Rays in the Assay of Biological Materials," A. Engström; "Tolerance of Man for Radioactive Isotopes," J. F. Loutit; and "Mechanical Properties of Fibers and Muscles," M. G. M. Pryor.

Colloidal Dispersions. Earl K. Fischer. New York: Wiley; London: Chapman & Hall, 1950. 387 pp. \$7.50.

A subject of great industrial importance, this monograph was planned as a guide to the theory and practice of the dispersion of solids in liquid media. For orientation, the latest methods for the determination of particle size are presented, followed by theories on the wetting of solids and the state of the dispersed solid. The second part of the book covers the manufacture of colloidal dispersions, including details on processes and machinery. In this section one is impressed by the preponderance of citations to U. S. patents. The data brought together in the volume will be welcomed by all interested in colloidals.

Proctology in General Practice. J. Peerman Nesselrod. Philadelphia-London: Saunders, 1950. 276 pp. \$6.00.

This study was prepared for the general practitioner who is becoming more and more intimately involved in the early diagnosis of rectal and colonic malignancy. In addition it has equal value for the medical student, the proctologist and the general surgeon. Chapter 1 is devoted to anorectal anatomy, physiology, and pathology as basic preparation for an understanding of the chapters that follow. Diagnostic procedures, preoperative management, and postoperative care are presented in a lucid, concise manner accompanied by well-selected illustrations. The book can be highly recommended.

News and Notes

Scientists in the News

Lloyd V. Berkner has been elected president of Associated Universities, Inc., to succeed Frank D. Fackenthal. Previously he was executive secretary of the Joint Research and Development Board of the National Military Establishment, and before that a consultant to NDRC. George B. Pegram, pioneer government adviser on atomic energy and vice president emeritus of Columbia University, has been elected chairman of the board of AUI. Dr. Pegram, who is also a consultant to the Oak Ridge Institute of Nuclear Studies, will preside at meetings of the 19-member board of AUI trustees. Mr. Berkner, as AUI president, will preside over the executive committee and administer all corporate activities.

Edna Brandau, director of merchandising in the College of Home Economics at Syracuse University, has been appointed director of education for The Wool Bureau. Mrs. Brandau, a merchandising authority and co-chairman of the Clothing and Textile Seminar at Syracuse University, will direct the bureau's newly organized Department of Education in its expanded program of wool promotion, education, and research.

Thomas A. Burch has been appointed medical officer in charge of a Public Health Service project in Liberia. For the past four years, Dr. Burch has been a staff scientist in the USPHS Laboratory of Tropical Diseases. Headquarters for the new PHS project will be the Liberian Institute of Tropical Medicine, of which Dr. Burch will also serve as director. The Liberian Institute, not yet completely constructed, was established in 1946 by the American Foundation for Tropical Medicine for the purpose of studying human and animal tropical diseases. The expenses of construction have been met in part through a gift of \$250,000 from Harvey Firestone, Jr., as a memorial to his father. Funds for laboratory equipment and supplies are to be made available through the Point Four Program, and research guidance and personnel are contributed by the Laboratory of Tropical Diseases. Dr. Burch and his team will investigate such tropical diseases as sleeping sickness, schistosomiasis, filariasis, and malaria. The Liberian Institute's facilities will also be available to other scientists interested in doing field research in the tropical diseases.

A. Henry Detweiler, of the College of Architecture at Cornell University, has been elected an associate trustee of the American School of Oriental Research for a two-year term. The organization, of which Cornell is a contributing member, has also appointed him chairman for 1951 of its Jerusalem school committee. Professor Detweiler spent January abroad as visiting professor of Roman archaeology at the Jerusalem school, organizing an expedition staff and supervising the resumption of excavation begun last winter in the Jordan Valley south of Jericho.

Paul E. Klopsteg, professor of applied science at Northwestern University, and director of research at its Technological Institute, left March 4 with Mrs. Klopsteg for Lahore, Pakistan, on invitation of the government of West Punjab Province. Dr. Klopsteg will serve as adviser on science and technology to a commission appointed by the government to study the organization and administration of the University of the Punjab, with a view to effecting changes that will result in better control, teaching, and administration of the university. The University of the Punjab is the principal degree-granting university in Pakistan, as well as the examining body for students who wish to enter college. It also exercises supervision over secondary education. Dr. and Mrs. Klopsteg expect to return in May.

Choh Hao Li, professor of biochemistry, University of California, Berkeley, will deliver this season's seventh Harvey Lecture at the New York Academy of Medicine on March 15. Dr. Li will speak on "Present Knowledge of Growth and Adrenocorticotropic Hormones."

William D. Lotspeich, now at Oxford University, will return to the University of Cincinnati College of Medicine next September as head of its department of physiology. Dr. Lotspeich will succeed Martin H. Fischer, now professor emeritus of physiology, and will occupy the Joseph Eichberg chair of physiology. Since Dr. Fischer's retirement, Gustav Eckstein, professor of physiology, has been acting department head.

D. F. Milam, who for the past two years has been national director of the Planned Parenthood Federation, has been appointed medical director of the New York Heart Association. From 1924 to 1949 he was on the field staff of the international health division of the Rockefeller Foundation.

Max Milner has been retained by the Midwest Research Institute as consultant in the field of cereal chemistry and technology. Dr. Milner will continue in his present capacity as professor of milling industry at Kansas State College while serving in this partitime position. He was formerly a research chemist at Pillsbury Mills and the University of Minnesota, and has been a member of the Kansas State faculty since 1947.

Dorothy M. Morgan, superintendent of St. Barnabas Hospital, Minneapolis, has been appointed director of nurses of the University of Chicago Clinics, to succeed Mary I. Bogardus, who retired February 1. Miss Morgan will be a member of the nursing education and hospital administration program faculties in addition to her duties as director of nurses, and will have charge of nursing services in Albert Merritt Billings Hospital, the Nathan Goldblatt Memorial Hospital, Bobs Robert Memorial Hospital for Chil-

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dren, the Home for Destitute Crippled Children, and the projected Argonne National Cancer Hospital and Charles Gilman Smith Hospital for Infectious Diseases.

Sigciti Moriguti, assistant professor of applied mathematics at the University of Tokyo, is spending the academic year 1950-51 in research and study of mathematical statistics at the University of North Carolina under the sponsorship of the United States Army. He is the author of numerous research articles and a book on the theory of statistics.

Alexander Nesmeyanov, chemist, and head of Moscow University, has been elected president of the Soviet Academy of Sciences. He succeeds the late Sergei Vavilov.

Edward A. Power will serve as chief of the Branch of Material Facilities of the recently established Defense Fisheries Administration. Mr. Power served in a somewhat similar capacity in World War II when he was detailed from the Fish and Wildlife Service to the Office of the Coordinator of Fisheries to assist in handling priorities and materials equipment requirements for the fishing industry. Mr. Power has been chief of the Statistical Section of the Branch of Commercial Fisheries since 1938.

Ruby Redford, since last August acting editor of Illuminating Engineering, has been named editor, succeeding G. Ross Henninger, who resigned last August to take a post with Iowa State College. Miss Redford was formerly with the General Electric Company Lamp Department at Nela Park.

Milner B. Schaefer has been appointed Director of Investigations for the newly formed Inter-American Tropical Tuna Commission. Mr. Schaefer, a fishery research biologist with the Fish and Wildlife Service, resigned from Federal service to assume his new duties with the Commission in San Diego, Cal. He has been stationed in Honolulu, where he has served since August 1948 as chief of the Section of Research and Development in the Service's Pacific Oceanic Fishery Investigations for the development of the tuna fisheries of the central Pacific Ocean.

Carl F. Schmidt, of the University of Pennsylvania School of Medicine, recently functioned as Georgetown University's Hachmeister Lecturer for 1951 because of his outstanding discoveries in the pharmacology of respiration. Dr. Schmidt is president of the American Society of Pharmacology and Experimental Therapeutics. The Hachmeister Lectureship in Pharmacology was established in 1949 by a grant from the A. C. Hachmeister Corp., Pittsburgh, in honor of its founder and first president.

David Seegal has resigned as professor of medicine, State University Medical Center at New York, and director of the medical services, Maimonides Hospital of Brooklyn, to accept the position of professor of medicine, College of Physicians and Surgeons, Colum-

bia University, and director of the Columbia University Research Service, Goldwater Memorial Hospital, Welfare Island.

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William Shanahan, formerly of the Institute of Psychoanalysis of the University of Chicago, has accepted appointment as professor of psychiatry at the University of Texas Medical Branch, Galveston, and director of the State Psychiatric Hospital. Dr. Shanahan has also directed the Division of Mental Hygiene of the Hawaii Territorial Health Department.

James H. Sterner has succeeded William A. Sawyer, Kodak's medical director for 31 years, who will continue with the company as medical consultant. Dr. Sterner, a well-known authority on industrial medicine and atomic energy health problems, has been Kodak's associate medical director since January 1949.

The Institute for Fluid Dynamies and Applied Mathematics is sponsoring a series of public lectures at the University of Maryland. John L. Synge, professor of theoretical physics at the Dublin Institute for Advanced Studies, opened the series with lectures on "Hamilton's Method in Geometrical Optics" and "The Relativity Theory of A. W. Whitehead." On March 29 and 30, M. J. Lighthill, professor of mathematics at The University, Manchester, will discuss Shock-Wave Phenomena; Alexander Weinstein will consider "New Methods for the Approximation of Eigenvalues" on April 10 and 11. The series will be concluded June 26, 27, and 28, when Johannes M. Burgers, professor of fluid dynamies, Institute of Technology, Delft, will present three lectures on "Non-uniform Propagation of Shock Waves."

Willis L. Tressler has recently joined the staff of the Division of Oceanography, U. S. Navy Hydrographic Office, Suitland, Md. He has been serving as associate professor of zoology at the University of Maryland.

Abraham White, chairman of the Department of Physiological Chemistry, University of California at Los Angeles School of Medicine, has resigned to become vice president and director of research of Chemical Specialties Company, Inc., New York.

Walter J. Williams, production manager of the Atomic Energy Commission for the past four years, has been made deputy general manager. He succeeds Carleton Shugg, who resigned to accept an executive post with the Electric Boat Company of Groton, Conn., which is developing an atomic submarine for the Navy. To replace Mr. Williams as production manager, the commission promoted R. W. Cook, now manager of the big Uranium 235 plant at Oak Ridge, Tenn.

Mark W. Zemansky, of the City College of New York Physics Department, has been elected president of the American Association of Physics Teachers. A former vice president of the association, he has been on the City College staff since 1921.

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Dr. and Mrs. Edwin J. Vickner have recently donated \$50,000 to Gustavus Adolphus College to set up the Almen-Vickner Foundation. Independently associated with the Folke Bernadotte Memorial Foundation—also established by the Vickners—its first project will be the creation of a museum illustrating cultural, scientific, and industrial development, especially of the U. S. and Sweden.

The American Academy of Arts and Sciences has awarded grants-in-aid to twelve persons in various parts of the country (though mainly in New England), for specialized studies in chemistry, physics, psychology, and several other sciences. The grants range from \$500 to \$2,000.

Arctic Institute of North America is offering research grants for 1952 for scientific investigations dealing with the arctic and subarctic regions. The work may be done in the field or at one of the Institute offices. Preference will be given to residents of North America, and completed applications must be received by next November 1. For information apply to Research Committee, Arctic Institute of North America, Broadway at 156th St., New York 32, or 3485 University St., Montreal, Canada.

Cornell has received a grant of \$5,000 a year for five years from The Salvatore Giordano Foundation, of Maspeth, N. Y., to underwrite basic research in the field of heat transfer. C. O. Mackey will direct the work, with the assistance of other staff members of the heat transfer laboratory of the Sibley School of Mechanical Engineering.

A March of Dimes grant of \$17,200 for the investigation of muscle action, under the direction of J. E. Markee, professor of anatomy at Duke University, will enable Dr. Markee and his colleagues to complete studies begun in 1945. The information so obtained is expected to be of tremendous value to surgeons and physical therapists working with the victims of infantile paralysis.

The Morchead Foundation has given \$2,000,000 to the University of North Carolina for scholarships beginning with next fall's classes. The scholarships will be awarded on the basis of demonstrated capability, character, leadership, and promise of future distinction and not on the basis of financial need. Men graduates of 31 North Carolina universities, colleges, and junior colleges will be eligible to apply this year.

The Muscular Dystrophy Association has given New York Hospital \$25,000 to try to find a cure for the disease, and is seeking \$250,000 for additional research. Contributions should be addressed to the organization at New York 53.

The National Foundation for Infantile Paralysis has provided a grant of \$23,956 to the Harvard School of Public Health for the development and evaluation of new methods of artificial respiration. It was at Harvard that the "iron lung" was developed.

More than 40 research projects will be undertaken this year at the University of Michigan, under grants amounting to \$51,351 from the Horace H. Rackham School of Graduate Studies. Work to be undertaken will include the creation of underwater harbor breakwaters, the preparation of a pollen atlas, and other studies in biology, physics, social science, the health sciences, fine arts, and language and literature.

The ONRL Human Resources Division, Psychophysiology Branch, is sponsoring visual studies by Brian O'Brien, University of Rochester, and by W. J. Crozier and W. S. Verplanck, of Harvard.

Research Corporation has awarded two grants to Occidental College for the investigation of the organic acids found in the fatty tissues of the brain, and for an attempt to determine the way in which halogen atoms are held to organic compounds. L. Reed Brantley, chairman of the Chemistry Department, will supervise the studies, with the assistance of W. Robert Winans and Frank L. Lambert. Pacific Union College has received \$1,600 from Research Corporation to assist the Chemistry Department in its work in spectrophotometry.

A grant of \$50,000 has been made by the Edward G. Schlieder Educational Foundation to the Louisiana State University School of Medicine for the support of research dealing with the toxemias of pregnancy. The project is under the direction of Curtis J. Lund and Howard J. Tatuni, of the Department of Obstetrics and Gynecology.

Swift & Co. has made a grant of \$18,000 to the University of Illinois Bacteriology Department for a three-year investigation of the spore-producing microorganisms responsible for most of the spoilage in canned foods.

New Wenner-Gren appropriations will support 23 projects concerned with the various divisions of anthropology and five field research projects to be carried on by Americans in Nigeria, northern Sweden, Mexico, and the Caribbean area. Eight grants out of the \$77,800 appropriated will go to scholars and institutions in Mexico, Great Britain, Sweden, France, Germany, Kenya, and India. Additional funds will go to ten U. S. colleges, universities, and scientific institutions.

In the Laboratories

Culminating six years of research, Du Pont has perfected an improved process for the commercial production of hydrogen peroxide and will build a new production unit near Memphis, Tenn., where it has already begun the erection of a sodium cyanide plant. Both units are expected to start operating before the end of 1952.

Sinclair Oil Corporation is enlarging its activities in the petroleum chemicals field, beginning with the creation of a new Petroleum Chemicals Division, which will devote its initial efforts to specialized petroleum fractions and petrochemicals now manufactured, such as aromatic solvents, lubricating oil additives, demulsifying agents, and sulfonates. John A. Scott will be head of the new division.

The Institute of Inventive Research, San Antonio, has announced the availability of more than 30 new products, processes, and techniques for licensing. These range all the way from aircraft instruments to valves (nonrestricting fluid check), and are described in a printed bulletin which is available upon request.

Low K. Lee, formerly with North American Aviation, at Downey, Cal., is now supervisor of electronic equipment packaging and miniaturization in the Electrical Engineering Department, Stanford Research Institute.

The U. S. Naval Ordnance Test Station at Inyokern, China Lake, Cal., has appointed Howard J. Fisher assistant to the associate director for research and development. Dr. Fisher was formerly with Procter & Gamble. Preston L. Taulbee, physicist, has joined the Inyokern Evaluation Group. A. Donald Walsh, professor of chemistry at Leeds University, who is currently visiting professor of chemistry on the Berkeley campus of the University of California, was a recent lecturer at Inyokern.

Southwest Research Institute has created a Division of Military Research and Development, designed to expedite governmental and industrial projects geared to the defense effort. New appointments to the Institute staff include: William W. Bradshaw, research physicist; Kenneth Brady, research engineer; James Bright, architectural designer; William J. Burkett, Jr., chemical engineer; Robert A. Doak, Jr., mechanical engineer; E. J. Dower, research engineer; C. Kinney Longacre (USAF, ret.); John Mannix, research engineer; Cheryle C. Smith, research physicist; and W. A. Strutman, research engineer.

Miscellaneous

Civil Defense News is a new publication summarizing ideas and developments in the field, published biweekly for local and state CD officials, company executives with CD tasks, industrial plant protection and safety officers, civic leaders active in CD planning, and press and periodical editors. Content is selected from publications of Federal, state, and city CD agencies, newspapers of all large cities, magazines and scientific journals, letters from CD officials, personal interviews with authorities, and the files of the Council on Atomic Implications, Inc. Robert B. Pettengill, director of the Sloan Foundation Teaching Institute of Economics at the University of Southern California, and Albert Gotlieb, executive secretary of the Council on Atomic Implications, Inc., are the editors.

Robert J. Kolenkow, a 17-year-old Niagara Falls, N. Y., high-school senior, among whose interests are

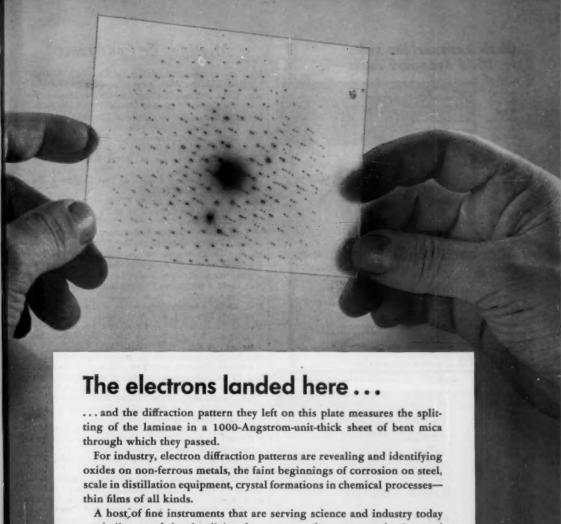
electronics, physics, chemistry, and astronomy, was winner of the grand prize of \$2,800 in the tenth Westinghouse Science Talent Search (Science, 113, 221 [1950]), which ended with a banquet in Washington, D. C., on March 5. He is the son of a U. S. immigration inspector and plans to enter MIT next fall to prepare for a career as a college physics teacher. His science project, the successful completion of which is prerequisite to winning a place among the 40 finalists, was the building of an electrical calculator that required six months of work. It contains 66 hand-made relays. In other projects Robert measured the speed of sound, made rayon, generated chlorine, and constructed an electronic musical instrument. He is president of the science club at Niagara Falls High School, vice president of the forensic society, and a member of the National Honor Society. He received the 1950 physics award at the Buffalo Science Congress and the American Legion Medal.

Second place, which includes a \$2,000 Westinghouse science scholarship, went to Frederick J. Ernst, Jr., of Ardsley, Westchester County, N. Y. Frederick, also 17, hopes to become a professor of mathematics and plans to enter Columbia University. He studied advanced mathematics on his own initiative and first tackled algebra at an early age—when he was in the fifth grade. Radio is one of his hobbies, and he is an active "ham." His science project was a report on "A Relativistic Explanation of Gravitational Acceleration of Falling Bodies near the Earth."

Eight other teen-age scientists were awarded \$400 Westinghouse science scholarships. They are: Karl Berkelman (17), Lewiston, Maine; Conrad V. Chester (17), Roslyn Heights, N. Y.; Rhea Mendoza (16), Kew Garden Hills, N. Y.; Peter Schneider (17), Brooklyn, N. Y.; Robert E. Simpson (17), Kenmore, N. Y.; Robert A. Spangler (17), Celina, Ohio; Richard M. Thomson (17), Delmar, N. Y.; and Nicholas A. Wheeler (17), The Dalles, Ore. The remaining 30 finalists received \$100 each.

Judges of the search were Harlow Shapley, director of the Harvard College Observatory; Harold Edgerton, vice president of Richardson, Bellows & Henry, Inc., consulting psychologists; Steuart H. Britt, director of personnel, McCann-Erickson, Inc.; and Rex Buxton, Washington psychiatrist. Three hundred high-ranking boys and girls (40 winners, 260 honorable mentions) were chosen from among 13,638 entrants, located in 34 states. In the ten Science Talent Searches, 400 young scientists have been given a start on useful careers in their chosen fields.

Watson Davis, director of Science Service, presided over the awards banquet, at which Henry DeWolf Smyth, a member of the Atomic Energy Commission, made the principal address. He declared, "It is even more important at the moment for us to encourage basic science than it was before the war..., for in the war years..., we drew heavily on our reservoir a basic knowledge."



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Meetings & Conferences

Mar. 11-14. American Institute of Chemical Engineers. The Greenbrier, White Sulphur Springs, W. Va.

Mar. 12-14. National Conference on Chronic Disease: Preventive Aspects. Edgewater Beach Hotel, Chicago.

Mar. 13-14. Institute on Classroom Planning. University of Pennsylvania, Philadelphia.

Mar. 13-16. National Association of Corrosion Engineers. Hotel Statler, New York.

Mar. 15. First Congress of World Meteorological Organization, Paris,

Mar. 15-17. American Society of Tool Engineers. Hotel New Yorker, New York.

Mar. 15-17. Biometric Society (Eastern North American Region) with the Institute of Mathematical Statistics. Oak Ridge, Tenn.

Mar. 16. Institute of the Aeronautical Sciences (Annual Flight Propulsion Meeting). Hotel Carter, Cleveland.

Mar. 16-19. Conference on the Teaching of the Earth Sciences in the Secondary Schools. Museum for Geographical Exploration, Harvard.

Mar. 18-22. Association of American Geographers. Palmer House, Chicago.

Mar. 19-20. American Association of Physical Anthropologists (Annual). Ann Arbor, Mich. Mar. 19-20. Histochemical Society. Detroit, Mich.

Mar. 19-23. Seventh Western Metal Exposition. Auditorium and Exposition Hall, Oakland, Cal.

Mar. 21-22. Symposium on Nature and Significance of the Antibody Response. New York Academy of Medicine. Mar. 21-23. American Association of Anatomists. Detroit.

Mar. 22-24. Michigan Academy of Science, Arts and Letters. Michigan State College, East Lansing.

Mar. 23-24. Southern Society for Philosophy and Psychology. Hotel Roanoke, Roanoke, Va.

Mar. 23-24. Fourth Regional Conference on Premedical Education, Alpha Epsilon Delta in cooperation with University of Alabama, Tuscaloosa.

Mar. 26-29. American College Personnel Association.

Stevens Hotel, Chicago.

Mar. 29-31. Congress of the Ophthalmological Society of the United Kingdom (Annual). London.

Mar. 29-31. Minnesota Section, American Chemical Society, Symposium on Chemistry and Functions of Proteins. Natural History Museum, University of Minnesota.

Mar. 30-31. Eastern Psychological Association. St. George Hotel, Brooklyn.

Mar. 30-Apr. 1. Conference on The Use of the Film in Training for Industry. Hotel Majestic, St. Annes-on-Sea, Eng.

Apr. 2-5. American Society of Mechanical Engineers (Spring). Atlanta.

Apr. 2-6. Conference on Radioisotopes in Industry, Case Institute of Technology, Cleveland.

Apr. 4-6. Midwest Power Conference (Annual). Sherman Hotel, Chicago.

Apr. 6-7. Texas Academy of Science (South Texas Regional). Corpus Christi.

Apr. 8-11. Electrochemical Society. Wardman Park Hotel, Washington, D. C.

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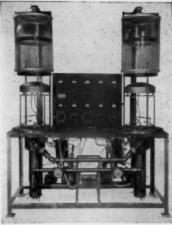
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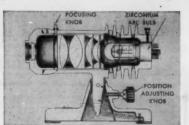
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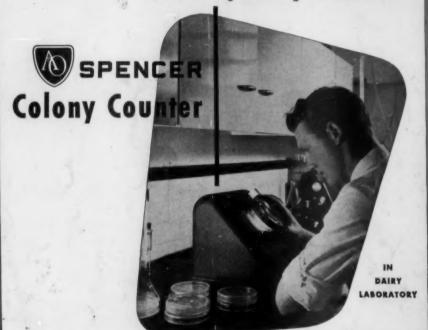
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